2018 Project Abstract
For the Period Ending June 30, 2023

PROJECT TITLE: Chronic Wasting Disease targeted outreach engaging culturally-diverse hunting communities
PROJECT MANAGER: Tiffany Wolf
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FUNDING SOURCE: Environment and Natural Resources Trust Fund
LEGAL CITATION: M.L. 2018, Chp. 214, Art. 4, Sec. 02, Subd. 10 as extended by M.L. 2020, First Special Session, Chp. 4, Sec. 2 as extended by M.L. 2021 First Special Session, Chp. 6, Art. 5, Sec. 3, Sub 19b.1 [to June 30, 2023]

APPROPRIATION AMOUNT: $270,468
AMOUNT SPENT: $188,581
AMOUNT REMAINING: $81,888

Sound bite of Project Outcomes and Results

Our project advances inclusive chronic wasting disease (CWD) management through collaboration with Tribal, southeast Asian, and Amish communities. Insights from surveys and interviews inform culturally-attuned CWD outreach, endorsing thriving deer populations while honoring cultural heritage. Our efforts promote community-engaged CWD response strategies to protect Minnesota deer health and community well-being.

Overall Project Outcome and Results

The success of Minnesota's efforts to control chronic wasting disease (CWD) hinges on the ability of government agencies, researchers, policy makers and stakeholders to work together, particularly as this issue relates to deer hunting as a CWD management tool. Yet, special outreach efforts are needed to better engage diverse stakeholders, such as Minnesota Tribal Nations and southeast Asian and Amish communities. Accordingly, our team connected with these communities through grassroots efforts to 1) learn more about community-specific hunting behavior and perceptions of CWD management and 2) engage in culturally-appropriate CWD outreach and education, with an overall goal of achieving more inclusive, community-based CWD management. Thus, we worked with community partners to collect interview data on CWD knowledge, perspectives, and impacts, as well as trusted sources for CWD information. Using these data we worked (and continue to work) further with community partners on the development of culturally-appropriate strategies for CWD outreach. Because of expressed interest by tribal natural resource managers for the development of CWD response plans for Tribal Lands, our team also conducted a quantitative survey of 140 tribal hunters from 16 midwestern Tribal Nations to understand hunting practices and CWD management preferences. Survey results demonstrated that cultural preservation and subsistence are the most important reasons tribal members hunt. Tribal hunters generally agreed that they have a key role in keeping the deer population healthy and most report they would test their deer for CWD if there was no cost. Most reported that CWD information has been limited but preferred to receive information from tribal natural resource agencies. Collectively, these data have informed the development of new CWD outreach materials and strategies for engagement of these diverse communities on CWD, as well as identified next steps for assisting tribal partners in the development of community-informed CWD response plans.

Project Results Use and Dissemination

Our project prioritizes dissemination efforts that enhance chronic wasting disease (CWD) awareness and education. We have crafted CWD factsheets, CWD Transmission and Progression booklets and coloring books, and translated materials that cater to Native American, southeast Asian, and Amish groups. We've engaged graphical artists to document real-time discussions, fostering accurate and interactive knowledge sharing. The MNPRO website serves as a comprehensive repository for CWD outreach and educational materials, complemented by print media and community event exhibits (e.g., Powwows, Earth Day, Filmore County Fair). Discussions with community partners have led to ongoing action plans for CWD outreach and education co-creation.

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND	**Environment and Natural Resources Trust Fund (ENRTF)** **M.L. 2020 ENRTF Work Plan Final Report**

Today's Date: 8/15/2023

Final Report

Date of Work Plan Approval: 3/17/2020

Project Completion Date: 6/1/2023

PROJECT TITLE: Chronic Wasting Disease targeted outreach engaging culturally-diverse hunting communities

Project Manager: Tiffany Wolf

Organization: University of Minnesota

College, Department, or Division: College of Veterinary Medicine, Veterinary Population Medicine

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Location: Statewide

Total Project Budget: $270,468

Amount Spent: $188,581

Balance: $81,888

Legal Citation: M.L. 2018, Chp. 214, Art. 4, Sec. 02, Subd. 10 as extended by M.L. 2020, First Special Session, Chp. 4, Sec. 2 as extended by M.L. 2021 First Special Session, Chp. 6, Art. 5, Sec. 3, Sub 19b.1 [to June 30, 2023]

Appropriation Language: $439,000 the second year is from the trust fund to an emerging issues account authorized in Minnesota Statutes, section 116P.08, subdivision 4, paragraph (d).

M.L. 2020 - Sec. 2. ENVIRONMENT AND NATURAL RESOURCES TRUST FUND; EXTENSIONS. [to June 30, 2021]

PROJECT STATEMENT: Chronic Wasting Disease (CWD) is a 100% fatal, contagious neurological disease of wild and farmed cervids, such as deer, moose, elk, and other deer species. It is caused by a prion, which is an infectious, misfolded version of a normal protein that is found in all mammals. Since first discovery in Colorado in 1960, CWD has spread to 26 states, including MN. In heavily affected areas like Wyoming, Colorado, and Wisconsin, more than 40% of free-ranging cervids are infected; and managers and researchers have documented CWD-associated population declines in several cervid species, including white-tailed deer. Although transmission to humans has never been confirmed, the risks for human infection remain unclear. Thus the best approach we have to protecting wildlife and human health is controlling further spread.

The success of Minnesota's efforts to control this disease hinges on the ability of government agencies, researchers, policy makers and stakeholders to work together, particularly as this issue relates to deer hunting as a CWD management tool. However, in December 2019, our team became aware that culturally-diverse hunting communities had not received critical information regarding CWD biology, management and potential human health risks. Special outreach efforts are needed to reach diverse stakeholders, such as our Minnesota Tribal Nations and southeast Asian and Amish communities. Additionally, the Grand Portage Band of Lake Superior Chippewa and our team have secured funding from US Fish and Wildlife Service to support the creation of a Tribal CWD Surveillance Network. A critical, yet unfunded need is simultaneous community engagement on Tribal Lands leading up to and during CWD surveillance in the 2020 hunting season. Our team has connected with these groups through grassroots efforts and is uniquely poised to engage them on CWD. Our goals for this project are to 1) engage in culturally-appropriate CWD outreach and education, and 2) learn more about community-specific hunting behavior and perceptions of CWD management, with an overall goal of achieving more inclusive, community-based CWD management.

II. OVERALL PROJECT STATUS UPDATES:

Amendment Request to extend project to June 1, 2022 is pending approval by Legislature as of 3/17/20

Amendment approved by the legislature and governor 6/29/21

Amendment Request August 20, 2020
Due to COVID-19 social-distancing guidelines, which has resulted in the cancellation of community events in much of 2020 where outreach and education was going to be conducted, as well as further consultation with MN Tribal natural resource agencies over the past several months, we are proposing a modification to Activity 1 for the duration of this project. Our new goal for this activity will involve working through community liaisons in a community based participatory research approach to gather relevant community data, including existing CWD knowledge, cultural influences of risk perceptions related to wildlife disease, and societal trust. The newly proposed Activity 1 will allow the project to move forward through additional data gathering among communities, which will further inform outreach materials, while ensuring health and safety during the COVID-19 pandemic. This work will be conducted with all three communities: tribal, Southeast Asian, and Amish. In addition, further discussion with our Minnesota Department of Natural Resource colleagues, they feel that Southeast Asian and Amish communities have been adequately reached through their own hunter and landowner surveys and that efforts would best be directed toward tribal hunters, which have not yet been surveyed. Thus, Activity 2 has been revised to focus hunting survey efforts specifically on tribal hunters and communities.

Accordingly, minor modifications to budgeted items have been made to more accurately reflect activity-related expenses. Additionally, funds for personnel support have been shifted from outreach material development support (reduced from 2yr staff support to 1 yr) to provide more support for coordination of data collection activities across all communities over both project years (M. Schwabenlander effort shifted from 10% over 1 yr to 10% over 2 years).

Amendment Approved by LCCMR 9/16/20

First Update January 4, 2021

The focus of the past 6 months of the project has been establishing new community partnerships across tribal, Southeast Asian, and Amish hunting communities in our effort to meet project goals. In some cases this has involved building on existing partnerships, whereas in most cases it has involved working through existing connections and resources to generate new project partner relationships. During this process we have taken time to introduce the project, identify individuals in each community who are willing and interested in joining our team as research partners, assess community interests and needs related to CWD, and assemble the resources our partners need for project success. This has been an exciting time as our team and community partners get to know each other, our collective capabilities, and new perspectives that better inform our approach and processes related to the proposed Activities. We have made good progress with tribal and SE Asian partners; whereas progress in moving our project forward with the Amish communities has been more complicated due to cultural differences and challenges associated with COVID-19 safety. Due to the pandemic, we have reevaluated our approach and ultimately have a richer community engagement plan in place, though we anticipate potentially slower progress associated with COVID-19 restrictions, particularly within the Amish communities. Finally, ahead of and throughout the 2020 deer hunting season, we successfully distributed 375 CWD factsheets and CWD Transmission and Progression booklets to tribal partners, 250 to Amish communities, and 100 to SE Asian communities.

Amendment request January 4, 2021

As the project has progressed and we have learned more about partner needs for project success, we have identified project expenses that we would like to make explicit in the project budget. We do not anticipate that these expenses will impact the funding amount associated with each line item. We are requesting the following amendments to the project budget:

1. Since we are working through community partners to collect the data we need to inform outreach materials, we are providing them with supplies to facilitate data collection, which includes electronic tablets. The tablets are crucial for uploading, storing and transferring data between partners and our team, particularly for community partners that do not have personal computers or similar devices sufficient to accomplish the work. These will be included in row 29 of the budget, under survey supplies and equipment. We have recently purchased (i.e., within the project period) six tablets at $250 each for this project, which we will assign and send to specific community partners to do the work. We intend for tablets to be returned to the university at the conclusion of the project for future use in similar studies.

2. We want to explicitly include shipping costs to send supplies and outreach materials to community partners. This will be included in row 29 of the budget, under supplies, equipment, and shipping costs. Shipping expenses are estimated at $20/shipment for up to 15 shipments (totaling $300) between the university and project partners.

3. We are also requesting approval to include participation payments for interviews conducted as part of our study in our project budget. These participation payments will be provided at the discretion of project community partners and will not exceed $15 per interview. Community partners will be reimbursed for these expenses through their contracts, thus this is included in Line 22 of the Budget.

4. We want to also explicitly include reimbursement for travel to conduct interviews by community partners in Budget Line 22. We expect the current Line 22 budget will accommodate these additional expenses (along with participant payments), given we have fewer community partners with less direct funding support needs than originally expected (e.g., related to accommodations for COVID safety).

Amendment Approved by LCCMR 2/3/2021

Second Update May 18, 2021

The focus of the past several months of the project has been supporting community partners across tribal, Southeast Asian, and Amish hunting communities in their efforts to gather information on CWD knowledge, perspectives, and responses to management. Since our last update, we are coordinating with partners from five Minnesota tribes (including the addition of White Earth Band as a partner) and a partner from the Hmong community. This is in conjunction with parallel work with two additional Ojibwe tribes in Wisconsin and Michigan, whose participation will add to the richness of information gathered. During this period we have worked to get University-tribal agreements in place to protect data and confirm scopes of work, as well as obtain research approval by tribal review boards on the agreed upon work plans. Importantly, our partners have been conducting interviews with community members during this period; the next steps are to work with them in the participatory analysis of these data over summer 2021. The biggest challenge has been in connecting with the Amish community, although during this period our team made two trips to southeastern Minnesota to meet with Amish community leaders and members. Despite slower progress in connecting with this community on a large scale and some reluctance by the community to engage on CWD, we are learning a lot about community perspectives and knowledge of CWD through rich, engaging individual conversations, as well as different ways we might engage further with the community.

Third Update October 1, 2021

We continue to support community partners in collecting qualitative data from their community members on their knowledge and perspectives related to deer and chronic wasting disease. Among the seven tribal and Hmong community partners on the project, half have completed interviews with community members on CWD, and half are in various stages of the process. The interviews that have been completed have now been transcribed from audio to written format in preparation for analysis, and the UMN project team is in the process of coordinating with interested community partners to begin participatory analysis (an approach to analysis that involves community partners in the process). Simultaneously, we have been coordinating with tribal natural resource managers to distribute a tribal hunter survey (piloted in the spring) in electronic and print formats to community members as hunting season begins. This quantitative survey instrument will provide additional data on hunter behaviors, perspectives on CWD and responses to management related to CWD. Both of these activities (i.e. the qualitative interviews and quantitative surveys) will be part of graduate research training of graduate student, Roger Faust, a tribal member of the Winnebago Tribe of Nebraska. He recently had an abstract describing our community engaged participatory project accepted for presentation at the Pathways 2021: Human Dimensions of Wildlife Conference, co-hosted by The Washington Department of Fish and Wildlife and Colorado State University and to be held on May 1-4, 2022, after postponement. We also wanted to note, although an amendment is not required, we are shifting funds within the personnel funding category of the budget from administrative support staff to a veterinary public health veterinarian to facilitate additional outreach and educational initiatives through the end of the grant period.

Amendment Request as of October 7, 2021

We are requesting a 1-yr, no cost extension to June 30, 2023 to more fully meet the goals of each of the activities associated with this project. While we are making positive progress in our diverse hunting communities, the COVID-19 situation continues to slow progress, particularly in relation to staff shortages in both the communities we work with as well as the UMN team. We are optimistic that a 1-yr extension will not only allow us to more fully accomplish our objectives, but will demonstrate to our communities our collective dedication to addressing this complex issue even during some of our most challenging times.

Amendment Approved by LCCMR 10/21/2021

Fourth Update April 1, 2022

Over the past reporting period we worked with community partners to finalize and transfer interview data collected through their efforts in their communities, processed those data into a format suitable for analysis, and initiated preliminary analyses. At this stage, we received data from 6 communities (5 Tribal communities and 1 Hmong community); two other Tribal communities that expressed interest in participation early on were unable to complete interviews. Tribal hunter surveys were also disseminated through the Tribal CWD Network (consisting of 8 MN Tribal natural resource agencies and 2 outside of MN); 41 survey responses were received, representing hunters from 9 Tribal Nations in the Midwest. We continue to work with partner Tribal natural resource agencies to identify additional opportunities for collecting more survey data. Finally, in early 2022, we hired a new Veterinary Public Health resident who will focus on engaging and collecting additional qualitative data from Amish communities in southeastern Minnesota over this final year of the project. We are utilizing our early preliminary data collected from key informants in multiple Amish communities to design an interview instrument. Interviews will key in on perspectives and decision-making related to harvest and consumption of venison and the perceived impacts CWD makes on those practices. These new data will inform future outreach and education efforts specific to these communities.

As of 3/11/22, the project manager confirms that Dr. Seth Moore is not deriving any direct personal financial benefit from this project

Fifth Update October 1, 2022

Over the past reporting period our team has continued in the collection of new data, while also embarking on data analysis to understand CWD knowledge, perspectives and information needs. In particular, we have made important progress in the qualitative analysis of tribal and Hmong interviews, where our UMN team is currently summarizing these analyses in preparation for engaging our community partners in further discussion and feedback on key themes emerging from the interviews. We also spent more time in the Amish communities of southeastern Minnesota where a team member (a newly hired Veterinary Public Health resident) conducted one-on-one interviews with Amish members from the three southeastern Minnesota communities. These data are also currently being analyzed for themes related to harvest practices, consumption of venison and the perceived impacts CWD makes on those practices. Finally, we continue to collect data on tribal hunter perspectives through our Tribal hunter survey, working alongside our tribal biologist partners to recruit participation at community events, such as pow wows and veterinary service clinics. We anticipate ongoing administration of the survey through the end of 2022, with analysis beginning in early 2023.

Sixth Update April 1, 2023

In the previous reporting period, we completed all data analyses associated with Activity 1 and began reporting results back to community liaisons and gathering final perspectives from partners on the integration of findings into new outreach materials and methods. We anticipate that by the end of the project we will have outlined strategies for ongoing CWD outreach in tribal, Hmong, and Amish communities. We are in the process of analyzing survey responses received through the Tribal Hunter survey, which closed at the end of the 2022 hunting season. We will be using findings from this project to plan a series of workshops to be held in May and June for the development of strategies for the co-management of CWD between state and tribal partners in and around tribal lands. This project was the focus of a presentation to members of the Society for the Advancement of Chicanos/Hispanics and Native Americans in STEM in October 2022 and three new additional abstract submissions for presentations at national conferences in 2023.

Final Report between project end (June 30) and August 15, 2023

The success of Minnesota's efforts to control chronic wasting disease (CWD) hinges on the ability of government agencies, researchers, policy makers and stakeholders to work together, particularly as this issue relates to deer hunting as a CWD management tool. Yet, special outreach efforts are needed to better engage diverse

stakeholders, such as Minnesota Tribal Nations and southeast Asian and Amish communities. Accordingly, our team connected with these communities through grassroots efforts to 1) learn more about community-specific hunting behavior and perceptions of CWD management and 2) engage in culturally-appropriate CWD outreach and education, with an overall goal of achieving more inclusive, community-based CWD management. Thus, we worked with community partners to collect interview data on CWD knowledge, perspectives, and impacts, as well as trusted sources for CWD information. Using these data we worked (and continue to work) further with community partners on the development of culturally-appropriate strategies for CWD outreach. Because of expressed interest by tribal natural resource managers for the development of CWD response plans for Tribal Lands, our team also conducted a quantitative survey of 140 tribal hunters from 16 midwestern Tribal Nations to understand hunting practices and CWD management preferences. Survey results demonstrated that cultural preservation and subsistence are the most important reasons tribal members hunt. Tribal hunters generally agreed that they have a key role in keeping the deer population healthy and most report they would test their deer for CWD if there was no cost. Most reported that CWD information has been limited but preferred to receive information from tribal natural resource agencies. Collectively, these data have informed the development of new CWD outreach materials and strategies for engagement of these diverse communities on CWD, as well as identified a next steps for assisting tribal partners in the development of community-informed CWD response plans.

III. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1 Title: Through community-based participatory research, gather information on community CWD knowledge, perceptions of risk, and societal trust for Native American, southeast Asian, and Amish communities in Minnesota.

Description: In December 2019, our team became aware that culturally-diverse hunting communities had not received critical information regarding CWD biology, management and potential human health risks. In response, our team mobilized and performed outreach events for both the southeast Asian and Amish hunting communities, which included the development of culturally-appropriate, translated fact sheets. Our goal with this activity is to transition to a more formalized, intentional approach, where we also gather data on how members of these diverse communities access CWD information, what CWD knowledge is currently lacking, best strategies for filling those gaps. This information will be used to inform the development of culturally-appropriate and community-specific outreach materials on CWD.

ACTIVITY 1 ENRTF BUDGET: $135,734

Outcome	Completion Date
1. Work through community partners to gather data on CWD knowledge, cultural influences on perceptions of risk related to wildlife disease, and societal trust.	*May 2021*
2. Characterize cultural perceptions of risk related to CWD, knowledge gaps, and societal trust across communities.	*September 2021*
3. Validate the translation of new knowledge into outreach materials with community partners.	*October 2021*

First Update January 4, 2021

Since project commencement, we have completed interviews with natural resource managers from 9 of 11 Minnesota Tribal Nations to assess tribal needs in relation to CWD outreach and management. Working through our established connections with natural resource managers and conservation officers among tribes and the MNDNR, we've identified and established community partners to advance the goals of this Activity in 4

Minnesota tribes (1 additional partnership pending) and the SE Asian community of the Twin Cities metro area. Over the past several months, this has involved further assessment of community needs and goals related to the project partnership, the creation of memoranda of understanding with each partner, establishment of data collection methods, and distribution of resources, supplies and training for partners to conduct interviews and focus group meetings within their respective communities, beginning January 2021. Proceeding with this approach has been more challenging with Amish communities, primarily due to some perceived reluctance to being directly involved in the research. However, our team's understanding is that the Amish communities are open to discussing CWD with our team, thus we are revising our approach for data collection within these communities, but recognize there may be some delays in progress due to the need for in-person meetings while abiding by MDH and University guidelines on COVID-19 safety. Lastly, we have successfully recruited a graduate research assistant to the project. As a member of the Winnebago Tribe of Nebraska, the graduate student, who begins in January 2021, will bring more background and perspective to the team that is highly relevant to the project.

Second Update May 18, 2021

Since the last project update, we have worked with each of our community partners (tribal and Hmong) to put in place agreements on data sharing, scopes of work, and tribal research approvals to ensure transparency, trust, and a smooth work flow with our community partners. We've hosted group meetings with all community partners twice per month during this period to conduct training in interview and focus group facilitation, to provide support and feedback as partners embarked on participant recruitment, and to make collective decisions on approaches to engage study participants, facilitate interviews, or manage data. We've also had two additional tribal partners (White Earth and Bad River) join the project. We anticipate that most partners will have completed interviews by the end of May-early June 2021, at which time we will begin data transcription and participatory analysis. Completion of Outcome 1 may be a few weeks behind the anticipated schedule, but accommodates delays associated with other demands on our partners' time and/or delays in obtaining research clearances/data sharing agreements (e.g., many administration bodies – both university and tribal – have been experiencing COVID-19 associated delays). Proceeding with a community-based participatory research approach has been met with more reluctance by the Amish communities, and so we have worked to adopt our approach in these communities. However, our team made two trips to southeastern Minnesota during this period to engage directly with community leaders and some community members. We have not been successful in organizing small group meetings with community members, although we have learned through several individual conversations with leaders and members that CWD itself is not a concern for the community (e.g. sick deer are not observed and people have not gotten sick), whereas there is more concern about how CWD is managed. We are learning about how we can better engage with the community and build on these ongoing conversations, as well as enhance our outreach for the approaching hunting season (using preliminary information learned thus far from the community).

Third Update October 1, 2021

We have been working with project partners over the last reporting period to collect qualitative data from community members on values around deer, knowledge of CWD and perceptions of risk and impact on the community through interviews conducted by our community partners. At this stage, approximately half of our seven tribal and Hmong partners have completed interviews in their community, those interviews completed have been transcribed from audio to written formats for analysis, and we continue to facilitate progress in the remaining communities through support of our community partners. Our UMN team is also coordinating a transition to the data analysis phase, in which we are working to create opportunities for our community partners to participate in analysis. This approach has come highly recommended by others working in community engaged participatory research as a way of ensuring accuracy and rigor in the analysis. For example, the analysis by outsiders of the community (e.g. UMN team) of statements made in interviews may fail to recognize the inherent relevance or importance of those statements, whereas such statements may be much

more apparent to community members (e.g., project community partners). In partnering UMN team members with community partners in the analysis and interpretation phase, we can ensure a richer and more culturally valuable product. Thus, over the next several months as we assemble and transcribe all interview data, we will also be working with community partners through an iterative process to analyze the data. This work will be an important aspect of Roger Faust's (PhD student) graduate training in the UMN Conservation Sciences graduate program. Overall, this part of the project is moving more slowly than originally projected, however, we continue to make good progress while also respecting the time and energy of our community partners, many of which are dedicated to the project, but also balancing responsibilities related to employment or personal life.

Fourth Update April 1, 2022

Community partners have completed all interviews for the collection of qualitative data related to CWD knowledge and perceptions of risk. We received qualitative data from 6 communities (5 Tribal communities and 1 Hmong community); two other Tribal communities that joined the project late were unable to complete this portion of the project as originally expected. The UMN team has worked over the past several months to process these data into a format suitable for analysis and are in the midst of analyzing these data through qualitative data coding methods and thematic analysis. As analysis is completed for each community, we will meet again with community partners to share findings and solicit initial feedback. This Activity has taken longer than originally anticipated to allow community partners to work at their pace. We have also spent some time revising our approach in engaging the Amish community on this issue. We have learned from key informants that CWD is of little concern to their communities; these observations were substantiated by little interest in our efforts to host focus groups on the issue and for the community members to lead interviews as was done in the Tribal and Hmong communities. However, after further discussions with some community members, the DNR social scientist, and others who have worked with Amish communities on health issues, we are revising our strategy to collect more information related to how community members make decisions on harvest and consumption in the context of wildlife disease, the perceived impacts of CWD, and sources of CWD information. We hired a new Veterinary Public Health resident in 2022 to lead these new efforts in our final year of the project.

Fifth Update October 1, 2022

Since completion of all interviews by Tribal and Hmong community partners, our UMN team processed these data into a format suitable for analysis (transcriptions of audio files) and has worked over the past few months to complete qualitative coding of the transcripts, a method used to systematically assess qualitative data. Thematic analysis, which allows us to pull patterns of meanings out of our systematic analyses, is on pace to be completed for all communities within the next week. When thematic analysis is completed for all communities, we will meet again with community partners to share findings and solicit initial feedback. Community partner feedback will ensure that the UMN teams' findings and interpretations of interviews agree with what they heard from their interviews and know of their communities, so that future outreach, engagement, and management plans using these findings properly reflect community sentiments.

Early project efforts to engage the Amish communities in southeast Minnesota through focus groups and community partner-led interviews were met with little interest from the community. Thus, we shifted our strategy to an interview format similar to that used in the Tribal and Hmong communities, but conducted by our team members. In doing so, we successfully completed interviews in 3 Amish communities that included a total of 16 Amish community members. At this stage, the UMN team has completed data processing and is currently analyzing this data using qualitative data coding methods and thematic analysis. After analysis educational and outreach tools will be created for planned engagement with community members.

Sixth Update April 1, 2023

At this stage of the project all data analyses have been completed. Project reports summarizing our activities and key findings have been developed for each community. On January 6, 2023, our team hosted a meeting with

Tribal partners from each of the communities that directly participated in or expressed interest and support of the project; these included Red Lake Band of Ojibwe, White Earth Nation, Mille Lacs Band of Ojibwe, Shakopee Mdewakanton Sioux Community, Bad River Tribe, Grand Portage Band of Lake Superior Chippewa, and Keweenaw Bay Indian Community. At this event, key findings were shared, and additional information and perspectives gathered. Importantly, a sample outreach document was circulated for comment and opportunities for further dissemination were discussed. These discussions continue at ongoing meetings of the CWD Tribal Surveillance Network, leading to specific action plans for ongoing partnership in CWD outreach and education material co-creation. In the coming weeks we will meet again with Hmong and Amish community partners to do the same information sharing and results dissemination with intent to co-create a similar outline for ongoing outreach dissemination.

Final Report between project end (June 30) and August 15, 2023
Information sharing with Amish and Hmong partners was conducted over the past reporting period, following up on the previous information sharing events with Tribal partners. These conversations have identified additional avenues for outreach dissemination (e.g., through hunter training workshops for the Amish) and conversations with community partners are ongoing. In addition to sharing information back with partner communities, we are also working toward dissemination of this project and its outcomes through the drafting of at least two manuscripts for publication. Most recently we presented these efforts at the International Conference of the Wildlife Disease Association, generating much excitement and interest among participants in adopting similar methods of engagement to reach historically marginalized demographics on wildlife disease issues.

ACTIVITY 2 Title: Survey Minnesota tribal members on hunting activities and perceptions of CWD, as well as understanding of and responses to CWD management practices.

Description: The Minnesota Department of Natural Resources (DNR) has surveyed hunters and landowners across Minnesota on hunting activities and CWD management perceptions, but there is recognition of under-representation of culturally-diverse groups, particularly tribal hunters. This is in part due to the fact that traditional, paper-based surveys that are effective in reaching masses are ineffective for more diverse groups. Thus, we will work with the MN DNR, Tribal natural resource managers and community members to leverage existing connections with hunters and other opportunities within these communities to *directly* connect with and gather this critically needed data from community members.

ACTIVITY 2 ENRTF BUDGET: $134,734

Outcome	Completion Date
1. Summarize survey responses from each group on hunting activities, perceptions and responses to management practices as they pertain to CWD.	*March 2022*
2. Provide recommendations on CWD management plans to Tribal natural resource managers that combine best scientific practices with culturally-relevant feedback obtained through tribal hunter surveys.	*April 2022*

First Update January 4, 2021
Over this reporting period, we have worked with project partners and social scientists on our team to develop a survey instrument to meet the goals of this Activity. The interviews conducted with tribal natural resource managers in this reporting period, as well as the MNDNR's hunter survey were used to inform the development of questions as well as methods for dissemination. The survey has been circulated among a small number of tribal natural resource managers and tribal hunters for validation and at this stage, we are in the process of updating the survey based on that feedback. Our current goal is to work with tribal natural resource partners to roll out the survey electronically shortly after the end of the current hunting season with paper-based or in-person delivery at the start of next season as hunters obtain their licenses.

Second Update May 18, 2021
Over this reporting period, we have worked with project partners to pilot a tribal hunter survey. The survey pilot was delivered electronically through Qualtrics. The survey consisted of approximately 50 questions that focused on hunting behaviors, perspectives on CWD, responses to different CWD management strategies, and information sources. It was shared with natural resources managers of 9 MN Dakota and Ojibwe Tribal Nations, the Great Lake Indian Fish and Wildlife Commission and 5 additional Ojibwe Tribal Nations in Wisconsin and Michigan. Natural resource agencies shared the survey with hunters through their Facebook pages or websites following the 2020/2021 hunting season. Responses were obtained from 23 individuals across 9 Ojibwe tribes in Minnesota, Wisconsin and Michigan. Our team qualitatively reviewed responses for indications of lack of clarity, poor response rate, or other issues suggestive of problematic question design. Subsequently, the survey has been revised for improvement and we are coordinating with tribal natural resource managers for a more intensive rollout with the start of the 2021 hunting season.

Third Update October 1, 2021
Over the past several months members of our team have met with tribal natural resource managers on a biweekly basis to prepare for CWD surveillance on reservations during the 2021 hunting season. Through this process, we have also worked to coordinate the delivery of a tribal hunter survey to better understand hunter behavior, knowledge and perceptions of CWD and responses to CWD management. Distribution of the survey began in September with the start of tribal hunting season. The survey is being delivered through paper and electronic-based formats, is being advertised through tribal natural resource management's websites and/or Facebook pages, and is available at hunter license and/or registration offices. At this time, twelve tribal natural resource agencies are distributing the survey and we have already received forty-one completed surveys from hunters. Over the course of the hunting season, we will continue to support natural resource managers in the distribution and advertisement of the survey to hunters to enhance participation. In association with survey distribution, we have also shared updated CWD outreach materials with natural resource managers for dissemination through their communities as hunting season takes off.

Fourth Update April 1, 2022
Over this reporting period, we collected and aggregated Tribal Hunter surveys that were disseminated to Tribal hunters throughout the 2021/22 deer hunting season through their Tribal natural resource agencies (this included 8 MN Tribal natural resource agencies and 2 outside of MN). Surveys were self-administered either on paper or online via Qualtrics, an electronic survey system. Forty-one survey responses were received, representing hunters from 9 Tribal Nations in the Midwest. Preliminary findings have recently been reported to our partner Tribal natural resource agencies, at which time additional opportunities for survey data collection were identified. To further supplement these data, discussions with a subset of the Tribal natural resource agencies have been initiated to explore additional methods (e.g. focus groups, etc) to collect hunter perspectives on CWD management. The information gathered through these combined efforts, along with scientific resources on CWD best management practices, will directly inform a draft CWD management plan that will be co-developed by a working group of the Tribal CWD Surveillance Network.

Fifth Update October 1, 2022
Over this reporting period, we continued to solicit and collect tribal hunter surveys throughout the 2021/22 deer hunting season and into the 2022/23 deer hunting season. Surveys were self-administered either on paper or online via Qualtrics. In addition to working with tribal biologists, we've also leveraged community events, such as pow wows and veterinary service clinics to conduct outreach on CWD and solicit more participation from hunters in the survey. Through this additional effort, we have more than doubled the number of surveys completed since April 2022, having 93 survey responses received, representing hunters from 9 Tribal nations in the Midwest. We intend to continue to leverage opportunities through the 2022/2023 hunting season to further expand our sample size ahead of final analysis. The information gathered through these combined efforts, along

with scientific resources on CWD best management practices, will directly inform a draft CWD management plan that will be co-developed by a working group of the Tribal CWD Surveillance Network.

Sixth Update April 1, 2023
Since the last reporting period we have closed the Tribal Hunter survey, having maintained it through two hunting seasons through dissemination by tribal natural resource managers and direct community engagement at five community events. Two events were powwows: one with the Fond du Lac Band of Lake Superior Chippewa and the other with the Grand Portage Band of Lake Superior Chippewa. Three events were at UMN student-led veterinary clinics with the Red Lake Band of Chippewa, Leech Lake Band of Ojibwe, and Mille Lacs Band of Ojibwe. Through these efforts, we obtained 140 survey responses, representing hunters from 16 Tribal nations in the Midwest. We are currently analyzing these survey data to report to tribal natural resource managers in the coming weeks. Preliminary results show that cultural preservation and subsistence are the two most important reasons tribal members hunt. Tribal members generally agree that they have a strong role in keeping the deer population healthy and most report they would likely test their deer for CWD if there was no cost. Most respondents reported that they do not receive much CWD information, but expressed preference for receiving information from tribal natural resource departments. These results will be leveraged in the planning of workshops in partnership with several tribal natural resource agencies to solicit community perspectives on specific CWD management actions, their impacts on culturally embedded subsistence practices, and other considerations. Information from these workshops will be used to guide conversations between tribal natural resource managers and the state in the co-development of management actions for controlling CWD in and around tribal lands. Planning conversations with natural resource managers from White Earth Nation, Red Lake Band of Ojibwe, and Leech Lake Band of Ojibwe have begun with the goal of holding workshops in May 2023. Output from these workshops will be shared with other tribal natural resource managers across the Midwest.

Final Report between project end (June 30) and August 15, 2023
Results from the tribal hunter survey are being disseminated to all tribal natural resource managers, highlighting hunter responses to specific management practices that may guide CWD management decisions. In the last two months of this project, we took this effort further by working closely with tribal managers to outline CWD management priorities, leading into workshops with hunters and other community members in White Earth, Leech Lake, and Red Lake. These workshops were a great opportunity for CWD outreach, and we were also able to assess perspectives on barriers and opportunities related to management priorities identified by managers. A draft management plan will soon be circulated to the natural resource managers of these Tribal Nations for further consideration, adoption, and implementation by the tribes. The draft management plan may be used as a template by other tribes for the adoption of CWD management strategies. Further, this process for engaging community members in action planning is a model approach that is of interest to other tribes (e.g., Keeweenaw Bay Indian Community) in the drafting of their own management priorities and plans.

IV. DISSEMINATION:

Description:
An inherent part of this project is the sharing and dissemination of information pertinent to the successful control of CWD in Minnesota. Additionally, our grassroots and community engaged approach will establish a direct connection with leaders and members of our Native American, southeast Asian, and Amish communities for continued information sharing. We will utilize a number of resources to reach our intended audiences, which includes:

- The MNPRO website https://mnpro.umn.edu/our-vision – this website has been established as a scientific resource for the broader community, and includes the community-specific outreach materials that have been developed for CWD education.
- Local print media (e.g. articles in local newspapers)- this is a resource our team has successfully utilized to disseminate project-related information to Tribal members.

- Graphical recordings – we will utilize the services of a graphical artists who captures real-time information discussed in group meetings through a transparent process that both engages audience participation and ensures accuracy of discussion documentation. An additional benefit is that the resulting discussion charts are left with the community to facilitate information sharing with the broader community beyond the meeting event.
- Outreach materials – our team has been developing innovative outreach materials that can be shared with diverse communities, and includes 3-D visual representations of the CWD prion and deer anatomy (for CWD sampling), translated CWD fact sheets, as well as booklets that are a low-tech visual demonstration of prion spread through a deer's body.
- MNPRO community event booth – community events (e.g. Treaty Days, Pow-wows) are a great opportunity to connect with large numbers of community members. We will work with community leaders and liaisons to identify opportunities to engage at such events.

Because we are utilizing this project to also generate new information on the needs of these diverse communities related to CWD outreach and education, as well as responses to CWD management, we also have a plan for the dissemination of these results to natural resource managers and community leaders, as well as other scientific audiences engaged in CWD management and human dimensions research. These will include:

- Reporting directly to community leaders and tribal natural resource managers.
- Scientific presentations at Tribal natural resource conferences (e.g. through the Bureau of Indian Affairs).
- Dissemination through scientific journals (e.g. Journal of Wildlife Disease, Interdisciplinary Journal of Partnership Studies) as well as other wildlife and management periodicals (e.g. The Wildlife Professional).
- Dissemination to MN DNR human dimension research team.
- Scientific presentations and discussions through USGS Wildlife Health Center and the NCDC234 Multistate Research Coordinating Committee and Information Exchange Group, both of which are conducting multistate human dimensions research pertaining to CWD spread and control. Our team is coordinating research activities with USGS and the NCDC234 Committee to enhance the reach and impact of our work in Minnesota. In particular, Dr. Wolf has joined the subcommittee for human dimensions CWD efforts for the NCDC234 Committee, where the results of this work will be particularly relevant.

The Minnesota Environment and Natural Resources Trust Fund (ENRTF) will be acknowledged through use of the trust fund logo or attribution language on project print and electronic media, publications, signage, and other communications per the ENRTF Acknowledgement Guidelines.

First Update January 4, 2021

Our team has distributed 375 CWD factsheets and CWD Transmission and Progression booklets to tribal partners, 250 to Amish communities, and 100 to SE Asian communities.

The project was also introduced to the Voigt Inter-tribal Task Force at their October meeting with a follow-up on the progress of the project at their December meeting. This Task Force includes representatives from the 11 Wisconsin and Michigan tribal members of the Great Lakes Indian Fish and Wildlife Commission (GLIFWC). This outreach garnered new interest in the project and resulted in additional support from GLFWC to involve at least two additional tribal communities from their membership in our efforts.

Dr. Wolf and other team members have also shared current knowledge and efforts with the NC1209: North American interdisciplinary chronic wasting disease research consortium Human Dimensions Working Group,

supported by the State Agricultural Experiment Stations (SAES) from the Hatch Multistate Research Fund (MRF) provided by the National Institute for Food and Agriculture (NIFA), as well as a newly formed working group on the integrated socio-environmental system of CWD, coordinated by the USGS and US Fish and Wildlife Service. Through these collaborations we strive to represent the needs and interests of more diverse hunting communities, as well as share methods and approaches. In particular, the Tribal Hunter Survey instrument will be curated with the Human Dimensions Working Group for future use in data collection by other CWD research teams around the country.

Second Update May 18, 2021
Since the start of our project our team has distributed 375 CWD factsheets and CWD Transmission and Progression booklets to tribal partners, 300 to Amish communities, and 100 to SE Asian communities. The project has also been shared through tribal partner websites, Facebook pages, and word of mouth through the community. In particular, the project was discussed and promoted by the Keweenaw Bay Indian Community on their local radio station (https://www.youtube.com/watch?app=desktop&v=ChLiZAnoHVI&fbclid=IwAR1VLFr0EjNvcbfQ19KKKRch34ZeOiGxqwGLIJQyP8s9-sQ0DgG_6kAqEU4).

The project was the focus of two presentations within this reporting period:

Wolf T. Engaging diverse hunting communities on Chronic Wasting Disease. Ecosystem Health Seminar Series, University of Minnesota, April 12, 2021.

Bernstein L. CBPR, professional identity, and building community partnerships. PUBH 6815 Community Based Participatory Research, University of Minnesota, April 3, 2021.

Third Update October 1, 2021
Graduate student researcher Roger Faust had an abstract describing this project accepted for presentation at the Pathways 2021: Human Dimensions of Wildlife Conference, co-hosted by The Washington Department of Fish and Wildlife and Colorado State University. I was originally scheduled to be held September 19-22, 2021, but due to COVID-19 surges has been rescheduled for May 1-4, 2022.

CWD factsheets and informational handouts were created to be shared with all community members participating in interviews with community partners. Early interviews revealed little knowledge of CWD among several tribal communities that had not yet been impacted by CWD, thus, factsheets were developed and assembled to 1) facilitate the interview process as well as 2) share additional, more detailed CWD knowledge following completion of the interviews.

We have been working through tribal natural resource agencies to distribute the tribal hunter survey in association with the start of hunting season, and in doing so created an informational flier on CWD, surveillance, and wildlife-safe ammunition. These fliers were distributed through 12 tribal natural resource agencies for dissemination at licensing offices, registration stations, and agency websites.

Fourth Update April 1, 2022
Abstract accepted:
Faust R, Wolf T, Bernstein L, Schwabenlander M, Landon L. Partnering with Diverse Hunting Communities to Tackle CWD. Pathways 2022: Human Dimensions of Wildlife Conference. May 2022.

Fifth Update October 1, 2022
As of this reporting period, our team has distributed 375 CWD factsheets and CWD Transmission and Progression booklets to tribal partners, 525 to Amish communities, and 100 to SE Asian communities. The

project has also been shared through tribal partner websites, Facebook pages, and word of mouth through the community. We've also engaged communities in CWD outreach at the following events:

- Iskigamizige-Giizis Pow Wow, Black Bear Casino, Hinkley, MN, April 16, 2022. Staffed a MNPRO booth to deliver CWD outreach and engage hunters and community members in discussions about CWD. Deeply engaged with 25 pow wow participants.
- Red Lake SIRVS Clinic, May 28-29, 2022. CWD outreach delivered to community members accessing clinic services as they entered the facility. 51 community members were engaged in discussions about CWD; 36 hunters completed the tribal hunter survey.
- Grand Portage Pow wow & Rendezvous Days, August 12-14, 2022. Shared an information tent/booth with the 1854 Treaty Authority and survey was distributed to hunters renewing licenses. 29 individuals from various tribal communities engaged in conversations on CWD; 12 hunters completed the tribal hunter survey.

Recent presentations:

Faust R, Wolf T, Bernstein L, Schwabenlander M, Landon L. Partnering with Diverse Hunting Communities to Tackle CWD. Pathways 2022: Human Dimensions of Wildlife Conference. May 2022.

Faust R, Wolf T, Bernstein L, Schwabenlander M, Landon L. Engaging Tribal Nations of the Great Lakes Region on Chronic Wasting Disease through a Community-Based Participatory Research Approach. North American Congress for Conservation Biology 2022. July 2022.

Recent publications:

Schwabenlander, M. D., Potts, N., Moore, S., Larsen, P. A., Bernstein, L. A., & Wolf, T. M. (2022). Upper Midwest tribal natural resource managers' perspectives on chronic wasting disease outreach, surveillance, and management. *Conservation Science and Practice*, e12710.

- Note: Communication from MN DNR leadership is that our recent publication Schwabenlander et al 2022 has been incorporated into their hiring process for wildlife managers who would actively cooperate with tribal nations in the management of CWD.

Sixth Update April 1, 2023

Scientific presentations:

Faust R, Wolf T, Fulton D, Bernstein L, Schwabenlander M, Landon L, Struck M. Engaging Tribal Nations of the Great Lakes Region on Chronic Wasting Disease through a Community-Based Participatory Research Approach. SACNAS National Diversity in STEM Conference 2022. October 2022.

Community engagement:

White Earth Community Outreach on Veterinary Education (COVE) event, March 14, 2023. CWD outreach delivered to community members accessing SIRVS clinic services as they entered the facility.

Legislative testimonies:

Dr. Peter A. Larsen. Minnesota Center for Prion Research & Outreach: Chronic Wasting Disease Update. Minnesota Legislature, Joint: House Environment and Natural Resources Finance and Policy and Senate Environment, Climate and Legacy. 7 Feb 2023

Final Report between project end (June 30) and August 15, 2023

Our project prioritizes dissemination efforts that enhance chronic wasting disease (CWD) awareness and education. We have crafted CWD factsheets, CWD Transmission and Progression booklets and coloring books, and translated materials that cater to Native American, southeast Asian, and Amish groups. We've engaged graphical artists to document real-time discussions, fostering accurate and interactive knowledge sharing. The MNPRO website serves as a comprehensive repository for CWD outreach and educational materials, complemented by print media and community event exhibits (e.g., Powwows, Earth Day, Filmore County Fair). Discussions with community partners have led to ongoing action plans for CWD outreach and education co-creation.

Engagement through Community Events

Focus Group Meetings with Tribal natural resource managers, hunters, and other community members, May 16, 2023 (White Earth), May 17, 2023 (Leech Lake), May 25, 2023 (Red Lake).
Public meetings held in White Earth, Leech Lake, and Red Lake to discuss the science and management of chronic wasting disease and solicit community feedback on the barriers and opportunities for CWD management.

Outreach/Follow up with Amish (June 13, 2023): Follow up with key community leaders in all 3 communities (Granger, Canton, St. Charles) to disseminate documents on the findings of thematic analysis in addition to fact sheets reflecting these concerns. 20 of each document were provided for distribution in each community. Identified 2 hunter safety instructors in communities to distribute additional materials during hunter education courses.

Filmore County Fair CWD Exhibit (July 18-21, 2023): Hosted an information booth on CWD over 4 days of the Filmore County Fair.

Recent Presentations

Faust, R**. A Community-Based Participatory Approach to Develop Chronic Wasting Disease Outreach with Tribal Communities.** 29 July - 04 August 2023, 71st Annual International Conference of the Wildlife Disease Association.

Yoder, C. **Let Nature Take its Course - Attitudes and Knowledge of Chronic Wasting Disease within Southeastern Minnesota Amish Communities.** 29 July - 04 August 2023, 71st Annual International Conference of the Wildlife Disease Association.

Faust, R**. Using a Community-Based Approach to Develop CWD Outreach with Tribal Communities** 31 May - 03 June 2023, Pathways: Human Dimensions of Wildlife Conference.

Faust, R**. Community-Based Efforts to Develop CWD Outreach with Tribal Communities.** Fond du Lac Tribal & Community College Earth Week Seminars, Cloquet, Minnesota. (April 19, 2023). Invited.

Manuscripts

Yoder et. al. Attitudes and Knowledge of Chronic Wasting Disease within Southeastern Minnesota Amish Communities. In preparation.
Faust et al. A Community-Based Participatory Research Approach to Chronic Wasting Disease Outreach Development in Upper Great Lakes Tribal Communities. In preparation.

V. ADDITIONAL BUDGET INFORMATION:

A. Personnel and Capital Expenditures

Explanation of Capital Expenditures Greater Than $5,000: NA

Explanation of Use of Classified Staff: NA

Total Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation:

Enter Total Estimated Personnel Hours for entire duration of project: 3,827.2	Divide total personnel hours by 2,080 hours in 1 yr = TOTAL FTE: 1.84

Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation:

Enter Total Estimated Contract Personnel Hours for entire duration of project: 1,920	Divide total contract hours by 2,080 hours in 1 yr = TOTAL FTE: 0.92

VI. PROJECT PARTNERS:

Name	Title	Affiliation	Role
Veterinary Population Medicine; Veterinary and Biomedical Sciences; Fisheries, Wildlife and Conservation Biology		University of Minnesota	Lead project partner
Grand Portage Dept. of Biology and Environment – Seth Moore	Director	Grand Portage Band of Lake Superior Chippewa	Co-leading project partner

A. Partners outside of project manager's organization receiving ENRTF funding
Tribal/Community liaisons and survey personnel – estimated 11-12% FTE to facilitate and coordinate community engagement and outreach activities within each community.

B. Partners outside of project manager's organization NOT receiving ENRTF funding
NA

VII. LONG-TERM- IMPLEMENTATION AND FUNDING:

The proposed activities will help fill high priority outreach and research gaps in engaging culturally-diverse communities in the management of CWD. The goal of this research is to fill existing gaps in CWD-related outreach in diverse communities, as well as enhance understanding of community-specific needs in regard to CWD information and management perceptions. We expect to produce results on community-specific engagement on CWD that will facilitate MNPRO's ongoing outreach efforts, as well as those of MN state agencies. We also expect that successful work in these communities will reveal new perspectives and questions that will inform future research efforts. In that case, we will use data derived from this project in future proposals to NSF programs (e.g. Dynamics of Integrated SocioEnvironmental Systems, https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13681).

VIII. REPORTING REQUIREMENTS:

- Project status update reports will be submitted April 1 and October 1 each year of the project
- A final report and associated products will be submitted between June 30 and August 15, 2023.

IX. SEE ADDITIONAL WORK PLAN COMPONENTS:

A. Budget Spreadsheet

B. Visual Component or Map

C. Parcel List Spreadsheet

D. Acquisition, Easements, and Restoration Requirements

E. Research Addendum

Attachment A: Project Budget Spreadsheet
Environment and Natural Resources Trust Fund
M.L. 2020 Budget Spreadsheet
Legal Citation: M.L. 2020, Chp. xx, Sec. xx, Subd. xx
Project Manager: Tiffany Wolf
Project Title: Chronic Wasting Disease targeted outreach engaging culturally-
Organization: University of Minnesota
Project Budget: $270,468
Project Length and Completion Date: 2 years; 6/30/2023
Today's Date: 08/10/23

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET		Budget	Amount Spent	Balance
BUDGET ITEM				
Personnel (Wages and Benefits)		$ 165,693	$ 162,556	$ 3,137
Veterinary Public Health Resident, $47,270, 20% effort x 2 yrs Add funding from support staff line $11,655	$ 30,564			
MS student, $46,176, 50% effort x 2yrs	$ 92,352			
Marc Schwabenlander (Program Manager), $97,100, 10% effort x 2yr	$ 19,420			
Tiffany Wolf (PI), $157,565, 5% effort x 2 yrs	$ 15,757			
Peter Larsen, (Co-PI), $190,024, 2% effort x 2 yrs	$ 7,601			
Professional/Technical/Service Contracts				
Tribal/Community liaisons and survey personnel to facilitate Tribal communications/meetings. These personnel will be community members that will be contracted for this project and not supported for work on this project through any other means. In addition to time on the project, funds will also be used to reimburse costs related to travel by community partners to facilitate data collection, and/or participant payments, not to exceed $15 per interview.		$ 48,000	$ 6,741	$ 41,259
Graphical recorder to record information from focus group meetings		$ 12,000	$ 2,834	$ 9,166
Material translation to serve multilingual stakeholders/study participants		$ 2,000		$ 2,000
Transcription and data entry of research/survey data		$ 5,000	$ 899	$ 4,101
Equipment/Tools/Supplies				
Outeach materials,Focus group meetings, 16 events, $450		$ 11,200	$ 6,630	$ 4,570
Survey supplies, equipment and shipping expenses. Supplies include six electronic tablets for data collection and transfer by community partners ($250/tablets), among other recording supplies. These will be assigned to specific community partners and returned to the university at project end. Funding to also cover shipping expenses to send supplies and outreach materials to community		$ 10,000	$ 2,658	$ 7,342
Travel expenses in Minnesota				
Travel to 2-3 meetings in Tribal and Amish communities; Includes lodging $80/night and M&E at $46/day for teams of 3, $42/day university vehicle rental.		$ 16,576	$ 6,263	$ 10,313
COLUMN TOTAL		$ 270,469	$ 188,581	$ 81,888

SOURCE AND USE OF OTHER FUNDS CONTRIBUTED TO THE PROJECT	Status (secured or pending)	Budget	Spent	Balance
Non-State: USFWS tribal wildlife grant	secured	$ 200,000	$ 37,969	$ 162,031
Non-State: UMN Office of Vice President of Research	secured	$ 22,440	$ 22,440	$ -
In kind: Seth Moore is a tribal employee (Grand Portage Department of Biology and Environment); this time on this project is considered an in kind contribution. 10% FTE ($130,000) x 2 years = $26,000	secured	$ 26,000	$ 13,000	$ 13,000
In kind: David Fulton is a federal employee (USGS), this time on this project is considered an in kind contribution. 10% FTE ($190,000) x 2 years = $38,000	secured	$ 38,000	$ 19,000	$ 19,000

Other ENRTF APPROPRIATIONS AWARDED IN THE LAST SIX YEARS	Amount legally obligated but not yet spent	Budget	Spent	Balance
Previous appropriation: M.L. 2017, Chp. 96, Sec. 2, Subd. 04g, Project Title: Chemicals of emerging concern in subsistence species used by Minnesota Chippewa, Project manager: Seth Moore		$ 400,000	$ 388,424	$ 11,576
Previous appropriation: ML 2016, Ch 186, Sec 2, Subd 6a, Project Title: Understanding the benefits and limitations of using goats for invasive plant control, Project manager: Tiffany Wolf	$ 242,882	$ 445,533	$ 380,322	$ 65,211
Previous appropriation: M.L. 2019, First Special Session, Chapter 4, Article 2, Subd. 03t, Project Title: Development of advanced diagnostic tests for Chronic Wasting Disease, Project manager: Peter Larsen	$ 606,576	$ 1,804,000	$ 1,156,180	$ 41,244

ENGAGING MINNESOTA'S TRIBAL NATIONS ON CWD

Targeted discusssions with Minnesota's Tribal Nations focused on increasing access to culturally-relevant information on the disease, including science and management, as well as seeking to understand barriers to and opportunities for tribal-led management.

FOCUSED COMMUNITY EVENTS

COLLABORATIVE ENGAGEMENT OPPORTUNITIES

Pictured above: Representatives from Grand Portage Band of Lake Superior Chippewa, Keweenaw Bay Indian Community, Red Lake Band of Ojibwe, Shakopee Mdewakanton Sioux Community, Mille Lacs Band of Ojibwe, White Earth Nation, Bad River Tribe, and the University of Minnesota, as well as Tribal natural resource managers, hunters, and other community members at meetings in January and May 2023.

www.mnpro.org | For more information: wolfx305@umn.edu

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND

MN PRO

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CONTRIBUTED PAPER

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WILEY

Upper Midwest tribal natural resource managers' perspectives on chronic wasting disease outreach, surveillance, and management

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Minnesota Environment and Natural Resources Trust Fund; United States Fish and Wildlife Service Tribal Wildlife Grant; University of Minnesota Office of the Vice President for Research; University of Minnesota Summer Scholars program

Abstract

Management strategies for chronic wasting disease (CWD) across tribal lands have varied in response to changing dynamics of CWD risk. As CWD continues to spread across the United States, concerns associated with the disease are increasing. We interviewed 19 natural resource managers representing Anishinaabe and Dakota tribes in Minnesota, Michigan, and Wisconsin with goals of understanding needs and opportunities for CWD engagement, surveillance, and outreach on tribal lands; the implementation of natural resources policy and management across tribal nations; and opportunities for tribal partnership-development to control CWD. Qualitative data analyses of interview responses revealed substantial variation in the number of tribal hunters, hunter regulation, and huntable tribal lands across our study area. Proximity of tribal lands in relation to CWD detections impacted tribal agency management strategies for CWD. Our results indicate a desire for CWD outreach and surveillance, mutually beneficial collaborations, and a need for incorporating cultural knowledge into CWD management strategies. We conclude that tribal CWD management and surveillance plans will be enhanced through strategic and thoughtful CWD outreach methods. Moreover, partnerships must recognize tribal sovereignty and respectfully integrate tribal values, knowledge, and worldview.

KEYWORDS

CWD, human dimensions, Indian, Michigan, Minnesota, Native American, partnership, tribal engagement, Wisconsin

1 | INTRODUCTION

Chronic wasting disease (CWD) is an increasingly important natural resources management issue across North America. Classified as a transmissible spongiform encephalopathy along with scrapie in sheep, bovine spongiform encephalopathy in cattle, and Creutzfeldt–Jakob disease in humans, CWD is caused by a misfolded prion protein

(PrP^{CWD}). Infected animals shed PrP^{CWD} through bodily fluids, excrement, and carcasses, which remain infectious in the environment for years (Prusiner, 1982; Rivera et al., 2019; Williams & Young, 1980). These misfolded prion proteins also accumulate in the body, resulting in neurological function loss, wasting or general weight loss, and associated complications such as pneumonia, always leading to death. CWD was first described in a cervid research facility in Colorado in the 1960s (Williams & Miller, 2002), and has since been detected in 30 US states, four Canadian provinces, Norway, Finland, Sweden, and South Korea (Mysterud et al., 2020; Richards, 2021; Williams & Miller, 2002).

CWD was first confirmed in the midwestern US in wild white-tailed deer in south-central Wisconsin in 2001 (Joly et al., 2003). Since that time, CWD has been detected in wild white-tailed deer throughout the upper Midwest states of Minnesota, Michigan, and Wisconsin and has become endemic in several areas. Subsequently, the dynamics of the disease have differed greatly in each of these states, leading to wide-ranging geographical and cervid population impacts (Richards, 2021; Rivera et al., 2019). Shortly after the discovery of CWD in Wisconsin, the federal government initiated coordinated efforts with state agencies, academic institutions, nongovernmental organizations, and tribal nations to develop a plan in response to the serious threat of CWD as it spread into new regions (USDA APHIS, 2002). This national plan aimed for federal agencies to provide tools and financial assistance for research, surveillance, disease management, diagnostic testing, technology, communications, information dissemination, and education. Despite these early conservation efforts, CWD continues to spread and has changed how cervids are hunted, raised, managed, and consumed in these areas. Its presence is a serious, multifaceted threat to subsistence and recreational hunting, cultural ceremonies, tribal and state natural resources, and the economies associated with hunting and farming (Mysterud et al., 2020; Parlee et al., 2021; Rivera et al., 2019). The geographic expansion of CWD has increased the number of midwestern tribal communities directly or indirectly affected by the disease (Figure 1). CWD detections in Minnesota, Wisconsin, and Michigan, at the time of the interviews, affected ceded lands from 15 separate treaties, including nearly 180,000 km^2 of ceded lands with expressly reserved tribal hunting rights. The 45 counties with CWD detections are within 40 km of 19 Indian reservation lands in Minnesota, Wisconsin, and Michigan. The 34 federally recognized tribes in the three states are impacted by CWD in the region.

Indians[1] rely on and derive many cultural and life-supporting benefits from tribal lands and the associated natural resources, including food, shelter, physical and spiritual well-being (Maraud & Roturier, 2021; Parlee et al., 2021). Deer (*waawaashkeshi* in the Ojibwe language) are an integral part of many of these Anishinaabe tribes' culture as a source of food, shelter, and community connection (Great Lakes Inter-Tribal Council Snap-Ed Program, 2015). The harvesting of resources, including *waawaashkeshi*, is guided

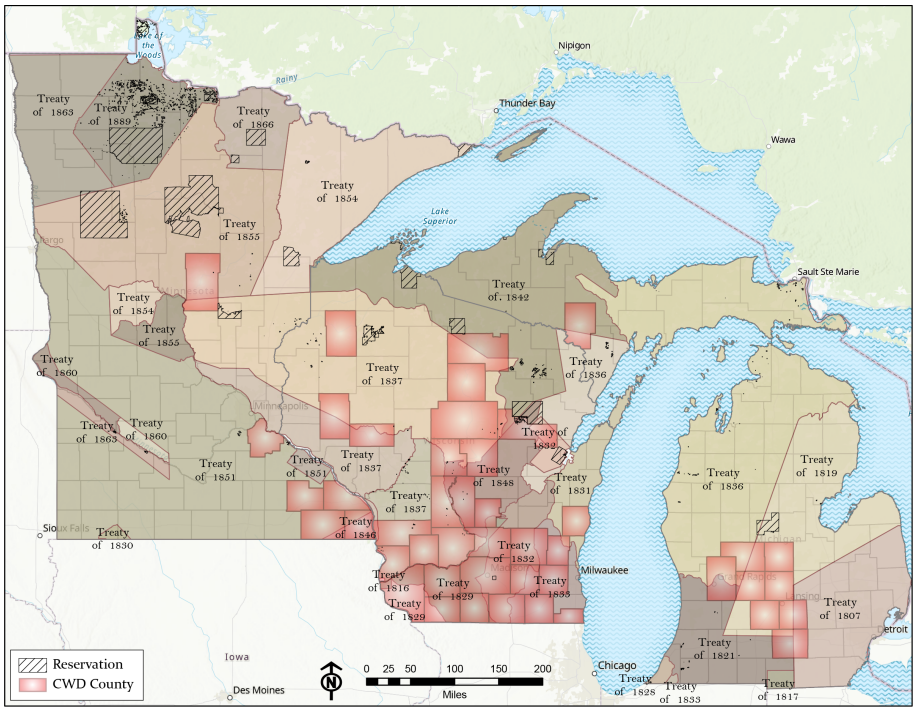

FIGURE 1 A map of Minnesota, Michigan, and Wisconsin lands included in United States federal treaties with tribal nations. At the time of tribal natural resource manager interviews conducted between March 20, 2020 and December 10, 2020: Tribal reservation lands are indicated by hatched polygons; counties with wild cervid chronic wasting disease (CWD) positive detections are indicated by pink polygons, and tribal hunters exercised hunting rights in lands associated with the treaties of 1836, 1837, 1842, 1854.

by generations of protocols that ensure life is sustained for people and the environment (Awāsis, 2021). These protocols are guided by community-based values systems that can be unique for different communities and tribes. The negative impacts of CWD on tribal nations parallel those of other local communities, however, traditional cultural practices and knowledge also bring unique perspectives and concerns.

Investigations by Parlee et al. (2021) and Maraud and Roturier (2021) in Alberta and Scandinavia, respectively, revealed complicated aspects of CWD management for Indigenous communities, including conflicts related to colonialism and tribal sovereignty, and traditional knowledge and western science. Specifically, Maraud and Roturier (2021) expressed that comanagement of the disease by Indigenous and governmental agencies within a colonial framework conflicted with traditional practices (e.g., current health standards vs. cultural practices, cervid population and land management practices). In addition, the Indigenous communities' risk perception of subsistence deer hunting differed when western science-based CWD information was available as compared to when only traditional knowledge regarding animal disease was available. For example, CWD information availability and government engagement was linked to increased risk perception leading to a decrease in deer harvest and an increase in CWD testing (Parlee et al., 2021). Tribal communities weigh the perceived risk of CWD within the context of their cultural practices, while also managing CWD as sovereign nations in dynamic relationships with other governing bodies, regulators, and stakeholders (Donatuto et al., 2011; Donoghue et al., 2010).

Due to the increased risk and continuing spread of CWD, tribal natural resource departments and managers in the upper Midwest United States understand the need to develop CWD outreach, surveillance, and management plans that include the aforementioned factors. In response to growing risks of CWD to food safety, security, risk to effective exercise of treaty rights, and limited tribal engagement in existing CWD management and control, several tribal nations and intertribal organizations established a Tribal CWD Surveillance Network (network) with University of Minnesota researchers. This early network included natural resource managers from eight tribal nations in Minnesota, one tribe in Michigan, and two intertribal natural resource agencies. Early network discussions revealed that many tribal partners did not have a CWD policy or plan in place, nor sufficient resources to independently manage CWD on tribal lands. To strengthen this partnership and reinforce tribal participation in CWD control, our team conducted interviews with tribal natural resource managers to enhance understanding of (1) the needs, capacity, and opportunities for CWD engagement, surveillance, and outreach on tribal lands; (2) the implementation of natural resources policy and management in different tribal nations; and (3) opportunities for partnership-development with tribes in cosharing knowledge and building capacity to control CWD. This was the first of several steps to learn how each tribal nation approached natural resource management and to enable the codevelopment of future outreach, management, and surveillance plans such that community-specific cultural needs are met (Brook & McLachlan, 2008; Gratani et al., 2014; Lewis & Boyd, 2012; Maraud & Roturier, 2021).

2 | METHODS

2.1 | Study area

Study participants were tribal natural resource managers among the 34 federally recognized Anishinaabe and Dakota tribes from throughout Minnesota, Michigan, and Wisconsin. We targeted natural resource managers who were part of the aforementioned network, either directly or through representation by an intertribal agency, and included 20 natural resource managers from 16 tribes and 2 intertribal agencies. Staffing levels among these regional tribal natural resources agencies ranged from 4 personnel to more than 60. Interviewees consisted of 19 tribal professionals that agreed to be interviewed (for a response rate of 95%). Interviewees represented more than 50% of the 34 federally recognized tribes of the three midwestern states. They included nine tribal natural resource managers from eight Minnesota tribal nations, five tribal natural resource managers from five Michigan tribal nations, three tribal natural resource managers from three Wisconsin tribal nations, and two tribal natural resource managers from two intertribal agencies, 1854 Treaty Authority and Great Lakes Indian Fish and Wildlife Commission (GLIFWC). The 1854 Treaty Authority is an intertribal natural resource management agency that protects and implements the off-reservation hunting, fishing, and gathering rights of the Bois Forte Band and the Grand Portage Band of Lake Superior Chippewa in the lands ceded under the Treaty of 1854. GLIFWC is an intertribal agency representing eleven Ojibwe tribes in Minnesota, Michigan, and Wisconsin (Mille Lacs Band of Ojibwe, St. Croix Chippewa Indians of Wisconsin, Bad River Band of Lake Superior Chippewa, Lac du Flambeau Band of Lake Superior Chippewa Indians, Mole Lake Band of Lake Superior Chippewa, Fond du Lac Band of Lake Superior Chippewa, Red Cliff Band of Lake Superior Chippewa, Bay Mills Indian

Community, Lac Vieux Desert Band of Lake Superior Chippewa Indians, Keweenaw Bay Indian Community, Lac Courte Oreilles Band of Lake Superior Chippewa Indians). All of the identified tribes above reserved hunting, fishing, and gathering rights on ceded territory in the 1836, 1837, 1842, and 1854 Treaties with the US government. Tribal land that tribal members hunted consisted of reservations, ceded territory, private property, and state and federally owned lands. At the time of the interviews (see below), CWD had been detected in wild and/or farmed cervids in 13 Minnesota counties, 9 Michigan counties, and 38 Wisconsin counties (Figure 1).

2.2 | Interviews

We conducted interviews via video conference or telephone due to in-person limitations of the COVID-19 pandemic between March 20, 2020 and December 10, 2020. We used a semi-structured interview approach to optimize conversation to collect independent thoughts from each individual and allow latitude to expand on the topics as necessary (Newcomer et al., 2015). Each interviewee voluntarily agreed to be interviewed as participants in the aforementioned network. The opinions shared by these tribal government employees interviewed in this study were in the conduct of their employment. We used a 15-question open-ended interview guide to collect the interviewees' professional perspectives on the local hunting community and practices, interactions with tribal leadership, CWD outreach, CWD surveillance, and CWD management within the tribal community they represented (see Supporting Information Materials S1). Questions were developed in cooperation with network leaders in order to gain an understanding of the CWD-based needs and opportunities across participating tribes for the purpose of future network initiatives. Project goals were presented to each interviewee prior to the interview. Written notes were transcribed during the interview on managers' responses by two project team members (T.W. and M.S.) in a shared electronic document (i.e., Google Doc).

2.3 | Data analysis

We analyzed transcripts using open and axial coding methods (Charmaz, 2006; Holton, 2007) in the qualitative data analysis computer software package NVivo 12 Pro (QSR International) as described in Bernstein et al. (2021). Two researchers (N.P. and M.S.) independently reviewed two interviews, and, using these, codeveloped a codebook classifying the interview responses (see Table S1). They then independently analyzed the remaining interviews through axial coding according to the codebook, and collectively, along with a third researcher (L.B.), summarized the coded data, identified preliminary themes based on the data, and conducted a thematic analysis that consolidated the summarized data into main underlying themes that emerged from interview responses (Charmaz, 2006). We performed kappa and percent agreement statistical analyses to establish the interrater reliability of the coding by multiple researchers (McHugh, 2012). Statistical analyses were performed separately for interviews of Minnesota-based and Wisconsin/Michigan-based interviewees as these two groups were considered separate populations and the interviews were analyzed separately by group as described above. Specifically, Minnesota tribal professionals within the network were interviewed early on in the study period, whereas the Michigan and Wisconsin tribal professionals were interviewed at later dates within the study period and were all from GLIFWC member tribes. Interrater reliability demonstrated a strong level of agreement (Kappa = 0.80; percent agreement = 99.0%) and a moderate level of agreement (Kappa = 0.66; percent agreement = 98.3%) for the Minnesota-based group and the Wisconsin/Michigan-based group, respectively.

3 | RESULTS

Tribal natural resource managers reported that tribal hunters mainly hunted white-tailed deer. Few hunted other cervids such as moose or elk as opportunities for these species were limited due to small numbers of huntable populations in Minnesota, Michigan, and Wisconsin. Tribal hunters rarely hunted cervids in other states or provinces. Historically, very limited cervid farming occurred on these tribal lands, and at the time of the interviews there were few to no known cervid farms on tribal lands or in near proximity to tribal lands. For one tribal nation it was stated that, "The conservation code is being updated to remove the ability for tribal members to have cervid farms." The few existing cervid farms were not owned or operated by tribal members and were managed through state and federal regulatory programs. Additional analysis of the interviews revealed four themes describing deer hunting, culture, and CWD within the tribal nations represented.

3.1 | Theme 1: Diversity across tribes

The number of tribal hunters estimated by tribal natural resource managers varied greatly, ranging from less than

100 to 5000 people per nation. Regulation of tribal hunters varied as some tribes required licensing, tagging, and/or reporting harvests, while others did not require formal licensing or reporting for tribal members. Some tribes allowed nontribal hunters access to hunt tribal lands, yet this was not common, with only four of the interviewees reporting legal nontribal hunter access. Tribal agency engagement was more developed and regularly occurred with nontribal hunters rather than tribal hunters. For example, in the few tribal nations that allow nontribal hunters on tribal lands, the nontribal hunters were required to purchase licenses and report harvests, which required visiting the agency and communicating with attending staff about regulations and registration of harvested animals.

Interviewees reported reservation areas of approximately 800–12,000,000 ha, which are not all huntable. Tribal members hunted on a diversity of land types including reservation, ceded territory, private property, and state and federally owned lands. Many reservations in the region were highly fractionated with some lands held in trust for the tribe, but also with significant mixed ownership by nontribal entities as a result of the Allotment Era (i.e., the physical break up of reservation land held in common by the members of a tribe into parcels granted to individuals of the tribe under the General Allotment Act of 1887, many of which have been transferred to nontribal parties over time) (Otis, 2014; Pevar, 2012). This was reported to complicate the management of both tribal and nontribal deer hunting as communicated by one interviewee, "(State) Department of Natural Resources (DNR) could come within the reservation boundaries to manage a CWD outbreak but not on tribal owned lands. Only about 16% of land within (the) boundaries are tribal owned lands." The location of tribal lands in relation to CWD detections in wild or farmed cervids was distinct for each tribe, ultimately affecting tribal agency response and management of CWD. At the time of the interviews, CWD had been detected only on ceded territory lands of these tribes, which may potentially be a consequence of limited surveillance and tribal capacity (further acknowledged in Section 3.2).

Tribal natural resource agency capacity differed greatly between the tribes represented in the interviews. Overall, as stated by an interviewee who works with multiple tribes, "the tribes don't really have staff and personnel with training and time needed for sampling and surveillance (for CWD)." In general, the Anishinaabe tribes, due to large ceded territories and their locations in more remote areas, had larger and more developed natural resources agencies than the Dakota tribes, which were in more developed areas and did not have reserved ceded territory hunting rights. Tribal natural resource agency infrastructure ranged from a few employees to much larger networks with multiple divisions; staffing levels among tribal natural resources agencies ranged from 4 personnel to more than 60. These dissimilarities stemmed from relative agency size and overall levels of program responsibility. Regardless of agency size, natural resource managers and agencies presented policy or regulation changes ultimately to tribal leadership (e.g., tribal council, chairman, board of directors) for approval of implementation. Some tribes incorporated a conservation/natural resources committee as an intermediary in this process. Most tribal councils allowed a comment period from tribal members to obtain public opinion on the proposed changes. One such example, a tribal natural resources professional stated that, "(The) advisory committee is a step between the natural resources agency and the tribal council (TC) where (the natural resource manager) gives recommendations and gets input. If the (advisory) committee agrees then TC goes along with it. Advisory committee is tasked to represent the community and get feedback from the community." This process, along with agency capacity, affected the tribal natural resource managers' potential ability to plan and respond to CWD in and around tribal lands.

3.2 | Theme 2: CWD outreach, management plans, and surveillance

Tribal natural resource managers collectively desired to strategically move forward in CWD-related actions of providing outreach to the community, creating management plans, and conducting surveillance on tribal lands. The envisioned procedures to achieve these goals were highly affected by the previously described variability in size and configuration of tribal lands, as well as agency capacity for implementation of CWD management activities across tribes. Specific CWD-related actions the participating tribal nations have previously performed and how the interviewees envision new action implementation are described below.

Outreach—Few tribal agencies represented in the interviews actively provided CWD outreach. Several tribal agencies delivered outreach and CWD information in the past, but with little reported interest from their constituents. Agencies provided informational pamphlets at license centers and conducted hunter surveys, for example, but interviewees stated that the efforts subjectively did not seem effective in raising awareness of CWD in tribal communities. This was explained as, the "disease has not been close, so people are not asking (about CWD), but it may become more important moving forward as (CWD) spreads." Wisconsin and Minnesota

tribes that were geographically closer to, or had members hunting in ceded territories impacted by CWD detections, continued to provide some CWD outreach. In addition, interviewees largely concluded that it was necessary to raise awareness about, interest in, and understanding of CWD in the communities. Interviewees suggested that social media and presence at community events may be effective mechanisms of outreach and should ideally reach both nontribal and tribal hunters on tribal lands and within proximity to tribal lands. While the general opinion that "social media posts may be really effective in reaching community members and generating dialog around the issue" was raised in multiple interviews, a few Tribal communities lacked a "mechanism for quickly reaching (the) community" and they have been only reaching "resident members and nonmembers passively."

Management plans—None of the tribal natural resource agencies had an active CWD management plan in place and thus if a CWD positive detection occurred on tribal lands, the managers described that they would likely be responding quickly with limited time for guidance and insight. The interviewees acknowledged that this would be a challenging scenario despite previous similar experiences and stated that developing a plan prior to conducting surveillance would ensure a streamlined, coordinated, and effective response. Tribes associated with GLIFWC did not have established tribe-level CWD management plans. However, several GLIFWC tribes located in Wisconsin were guided by a CWD Management Area plan that provided recommendations on carcass transportation, registration, testing, and disposal in CWD management areas, but did not offer guidance on management response to new detections (Great Lakes Indian Fish & Wildlife Commission, 2019). Interviewees agreed that the easiest approach to develop CWD management plans would be to adapt existing management plans or best practices to meet tribal needs and priorities.

Surveillance—The majority of the tribal natural resource managers had not recently conducted CWD surveillance on tribal lands. Approximately half of the interviewees reported historical CWD surveillance efforts through the previously referenced 2002 US Department of Agriculture (USDA) grant program over a short duration. Tribal natural resource managers collectively reported that past surveillance was minimal and largely unproductive because of minimal sampling, narrow geographical representation, year to year inconsistencies in design, and overall limited community participation.

At the start of this project, collaborative CWD surveillance among Minnesota tribes was in development. Michigan and Wisconsin tribes described growing surveillance efforts through state-tribal natural resource agency collaborations, although efforts were still limited by community participation, available funding, and tribal agency capacity. Most tribal natural resource managers indicated that they would like to expand surveillance programs prior to opportunistic CWD detection (e.g., discovery of a sick deer). A passive surveillance approach along with targeting regions with higher risk of CWD (e.g., cervid farm, detections in wild cervids) was preferred to confirm that the regions remain CWD-free. The "goal is to prevent (CWD) from becoming endemic, to detect (it) early." The details of this strategy were not yet defined, but it was clear that mandatory testing of hunter harvested deer would not be well accepted in the communities and "opportunistic sampling of hunter harvested animals on reservation and ceded territory, roadkills, (and) sick animals" was a preferred way forward. Strategies considered by managers for enhancing community participation included implementing deer head drop-offs at key locations within the community that would allow a hunter to leave a deer head and associated metadata for agency staff to pick up and collect samples for testing, along with participatory incentives (e.g., lead-free ammunition, gas cards, gift certificates to tribal businesses, raffle entries), as these options could be inexpensive, appealing to hunters, and require minimal agency staffing time.

3.3 | Theme 3: Nontribal collaborations

Interviewees indicated that tribes were interested in working with outside organizations including state, federal, and university partners when dealing with CWD, but such collaborations may be complicated. All interviewees and their representative tribal agencies had worked with state DNRs and other state entities in some capacity. To date, DNR engagement with tribal hunters on CWD was minimal. Most working relationships between state DNR and tribes were described as good and productive, but not all. All interviewees communicated that they would consider working with their state DNR again to comanage CWD. Some state agency or DNR partnerships were considered necessary for CWD-related management due to the state agencies' larger capacity for wildlife disease related issues and for those tribal lands where comanagement of natural resources was already in place (e.g., ceded territory) and because "state, private, and forest service lands (are) within reservation boundaries." Importantly, the need to begin these relationships as equal partnerships that recognize tribes as sovereign entities was noted in many of the interviews.

The federal Indian trust responsibility is a legal and moral obligation of the United States to "ensure the protection of tribal and individual Indian lands, assets, resources, and treaty and similarly recognized rights"

(US Department of Interior, 2014). Due to this trust responsibility of the federal government to federally recognized tribes, interviewees reported that tribes regularly work with the federal government on natural resources projects, including CWD, and managers indicated a willingness to continue work with federal agencies. States have never (and cannot) form treaties with tribal nations and thus have not assumed the overarching federal trust responsibility that developed when the treaties were originally signed between sovereigns. Tribal natural resource managers described the relationship with tribes and the federal government as a more equal partnership than their relationships with state agencies, and from that perspective, was more advantageous to tribes. The federal government relationship is a peer to peer relationship, with two sovereign nations working together as governmentally independent entities, which stems from the fact that treaties were signed as coequal sovereigns between the United States and each tribe that signed (Kalt & Singer, 2004; US Commission on Civil Rights, 2003).

All tribal natural resource managers explained that they would welcome university expertise for CWD outreach and planning. The interviewees explained the greatest benefit would be to explain CWD in a relatable and understandable way to the tribal communities. For several tribes, this type of collaboration with outside expertise was successful on issues such as deer and carnivore population management, CWD, and others that were not disclosed in the interviews.

3.4 | Theme 4: Low impact, high value

It was apparent in summarizing the interviews that two points predominated regarding the ultimate success of CWD outreach, surveillance, and management efforts: (1) it cannot increase administrative and capacity burdens on tribal natural resource managers and tribal hunters, and (2) it must include tribal values, perspectives, and input. Surveillance needs to be logistically easy for hunters to participate in, easy for the tribal natural resource agencies to operate under limited capacity, and inexpensive for the tribal community. It is important to understand that most tribal natural resource agencies have a small percentage of the average state natural resources agency employee base, while incurring the same responsibilities over nearly the same size of landbase. Collectively, interviewees remarked that any success in managing CWD among tribal nations would require tribal community and agency cooperation with minimal negative impact to the individuals.

3.5 | Thematic differences

There were many similar responses between Minnesota, Michigan, and Wisconsin tribes, however there were also notable differences, primarily related to proximity to CWD positive detections. In Minnesota, only three tribes had CWD detections near their tribal lands at the time of the interviews, while in Michigan and Wisconsin, numerous ceded territory lands had multiple and well-documented CWD detections. This demonstrated a greater experience of living and hunting with CWD among Michigan and Wisconsin tribes, leading to further differences in interview responses related to CWD outreach, management, and surveillance. The overall response to CWD by Michigan and Wisconsin tribes was more intentional and assertive, as it involved more engagement with tribal hunters on CWD and greater participation in CWD surveillance programs led or supported by state agencies. Despite state agency collaboration, less satisfaction with state agency partnership was reported in Michigan and Wisconsin as compared to Minnesota. In all three states, interviewees concluded that more could and should be done to counter CWD.

4 | DISCUSSION

The overall goal of the project was to obtain current perspectives on existing CWD management approaches among tribal agencies and provide insight into how external partnerships can benefit needs as CWD continues to spread. Nearly 20 years after CWD was discovered in the Midwest, we interviewed 19 natural resource managers representing Anishinaabe and Dakota tribes within the upper Midwest region coinciding with the establishment of a Tribal CWD Surveillance Network. CWD management on tribal lands has historically been limited to intermittent surveillance when external federal governmental support has been available. Given growing CWD concerns and the limited CWD management efforts on tribal lands up to this point, tribal natural resource managers recognized the need to enhance CWD outreach to tribal communities, develop tribal-specific CWD management plans, and expand CWD surveillance on tribal lands.

Each tribe's sovereignty and relationship with federal and state governments underlies limitations of past CWD management efforts and shapes the future of CWD response efforts. As Kalt and Singer (2004) stated, "Tribal sovereignty is recognized and protected by the US Constitution, legal precedent, and treaties, as well as applicable principles of human rights." However, historical federal

funding, support, and treaty promises to tribal nations, including the management of natural resources, have been largely unfulfilled (Day, 2020; Donoghue et al., 2010; Kalt & Singer, 2004; US Commission on Civil Rights, 2003). In regard to CWD specifically, $1M in USDA funding to support Indian tribes was made available in federal fiscal year 2003 (US Commission on Civil Rights, 2003). Interviewees indicated that many of the tribal nations cooperated with federal agencies to conduct CWD surveillance at that time, but the program collapsed due to high administrative burdens in comparison to the available funding for each tribe and the lack of tribal hunter cooperation. Since then, specific federal funding for tribal nations to address CWD has been nonexistent until 2020. In addition, coordination with state-level CWD efforts has been difficult. These events, along with the continued spread and risk of CWD to tribal communities, have elevated the interest of tribal nations in the upper Midwest to further develop collaborations with state and federal agencies, while asserting their rights to self-determination, as the limited infrastructure of individual tribes restricts effective CWD management. Implementation will be enhanced by unity within and among tribal communities and coordination with state and federal agencies as CWD, like other diseases, does not respect jurisdictional boundaries. Importantly, the success of CWD collaborative efforts requires that they be sustainable, reflect the priorities of tribal nations, and meet the needs of tribal agencies. In the past (and presently), tribal community beliefs and practices were often overlooked by outside organizations, resulting in strained relationships (Bennett, 2019; Donoghue et al., 2010). The results from our study suggest that some tribal nations are still experiencing these same issues.

An important need identified through this project was that all tribal agencies represented did not yet have, but recognized the need for, a CWD management plan to be developed in order to successfully and effectively manage CWD on tribal lands and in tribal communities. Almost all felt that development of management plans would benefit from external coordination and support, including collaboration with scientific and management partners to develop plans based on best practices while also integrating tribal culture and priorities. This could be a next step for all tribes represented in this study since no plans were in place, and particularly useful for tribes potentially at risk for CWD detection. Developing a plan prior to initiating or expanding surveillance would ensure a streamlined, coordinated, and effective response to a CWD detection. Surveillance absent CWD management planning may lead to uncertainty of CWD management steps in the event of a positive finding. Available resources that could be adapted for this purpose include the aforementioned GLIFWC plan, the Association of Fish and Wildlife Agencies' best management practices (Gillin & Mawdsley, 2018), and the associated states' CWD response plans. The variability in tribal hunting regulations, interactions with tribal and nontribal hunters, and agency capacity will likely impact the type and extent of CWD surveillance and management that is realistic for each nation. The resources identified by tribal managers as not available include collective agency time, staffing, and capacity for long-term implementation. In all likelihood, tribal agencies geographically closest to the CWD positive areas will lead in the development of CWD management plans that may then be shared among other interested tribal agencies. This practice is regularly used by tribal nations, where providing assistance and sharing intellectual property for a greater good has been commonplace.

While there was strong interest in conducting CWD surveillance on tribal lands, hunter participation in surveillance may need to be bolstered with incentives or CWD outreach. Incentivizing harvest and sample submission for CWD surveillance has shown to increase participation, albeit minimally, in tribal and nontribal communities (Petchenik, 2006; Seth Moore, personal communication). In addition, engagement with tribal communities through CWD outreach may lead to greater awareness, interest, and understanding of the disease and management. This is especially important because the perception among interviewees was that CWD has not been geographically close enough to raise interest or concern in the communities, particularly in Minnesota. Outreach on CWD has the potential to garner support from the community to increase hunter participation in surveillance and other CWD management efforts (Amick et al., 2015). Outreach may also promote community buy-in and adoption of newly developed management plans if a CWD positive deer were found on local tribal lands. As CWD continues to spread, this scenario becomes more likely.

While tribal nations generally shared the same goals for outreach, management, and surveillance, our interviews revealed that each tribal nation is a unique entity with different needs and processes for their implementation. Interviewees largely agreed that although efforts could be shared at a high level across tribal nations, each sovereign nation must maintain the autonomy of more detailed actions that meet their own community needs, which is the basis for the additional information gathering described below. The coordination of these efforts and sharing of resources can facilitate management goals for each tribe, which is a key approach for the Tribal CWD Surveillance Network. Moving into the 2020 hunting season, many tribes represented in the interviews saw the Tribal CWD Surveillance Network and/or state CWD surveillance as opportunities for such cooperation.

Partnership among tribes and nontribal entities can be successful. Several Minnesota tribes, the University of Minnesota, and federal and state agency collaborators led efforts to sustainably manage wild rice in the Midwest (Matson et al., 2021), evaluate the zoonotic risk of parasite transmission from wildlife to domestic canids (Bernstein et al., 2021), enhance understanding of factors related to moose calf survival (Van de Vuurst et al., 2021; Wolf et al., 2021), and evaluate contamination by pharmaceuticals in fish, waters, and sediments (Deere et al., 2020, 2021; Servadio et al., 2021). These efforts provide examples where Indigenous people, with unified culturally-based goals, partnered with multiple groups and governments, ultimately leading to improving the state of knowledge in support of traditional harvest activities consistent with treaty rights.

Planning for CWD outreach, management, and surveillance must explore ways to equally integrate traditional ecological knowledge (TEK) with western science, particularly when it comes to understanding disease. TEK is a combination of the knowledge, cultural practices, and beliefs passed down from generation to generation of Indigenous communities that addresses how humans interact with all aspects of their environment (Berkes, 2017). The ecology of CWD fits this belief system perhaps better than any wildlife disease as aspects of human behavior, animal health, plants, water, air, and earth are all vital aspects of CWD transmission. Successful comanagement of CWD between tribes and outside entities can be enhanced when traditional knowledge and cultural values are equitably considered alongside western science-based management strategies. Parlee et al. (2021) and Maraud and Roturier (2021) described the complicated nature of this blending, but it is not an impossible endeavor. The Nunavet Wildlife Act incorporated the societal values, principles, and hunting practices of the Inuit into territorial ecological management practices (Government of Nunavet, 2003, 2013). Two decades later, this practice continues as TEK is woven into natural resource management through federal and tribal government collaboration (Eisenberg, 2019).

A theme surmised from the interviewees was the need to include tribal values, knowledge, perspectives, and input in future CWD management efforts. Therefore, results from this project directed a subsequent project that engages community members in the collection of additional data on community knowledge, perspectives, and behaviors related to CWD. This includes information on how traditional teachings facilitate understanding of CWD and other wildlife diseases. Results from this effort will inform the codevelopment of CWD outreach materials for these tribal communities that incorporate their values and traditional teachings and knowledge. Furthermore, based on expressed interest by several tribal natural resource managers interviewed, we codeveloped a survey of tribal hunters to better understand their hunting behaviors, current CWD knowledge, and perspectives on existing and potential CWD management practices. This was disseminated through network tribes across Minnesota, Michigan, and Wisconsin during the 2021–22 hunting season. These survey data will directly inform CWD outreach to tribal hunters and the development of tribal CWD management plans that incorporate the values, beliefs, and culture of the unique tribal communities.

We appreciated a few limitations associated with this study. First, many of the interviewees were part of the network and had a vested interest in CWD management, potentially leading to acquiescence bias. Second, interviewees did not include representation from all tribes, limiting the scope of perspective from regional tribal nations, particularly those that are small and/or without treaty-reserved rights to hunt in ceded territory. Third, richer conversation would likely have occurred with in-person interviews. Finally, the perspectives gained were from natural resource professionals working for the tribal nations, and not the tribal community itself. While the latter would provide a broader perspective on the tribes' underlying values related to CWD management and external partnerships, the experiences and perspectives of the interviewees in the capacity of their profession provided key insights directly related to the goals of this study.

With the establishment of the network, university partners had limited experience with many of the partner tribal natural resource agencies and little direct knowledge of existing capacity, needs, or tribal policy and governance related to natural resource management. By engaging with tribal natural resource managers through this project, the university team obtained a better understanding of partner needs and priorities, and how a university-tribal partnership might be most productive. In follow-up of the interviews with tribal natural resource managers, a brief report was disseminated to the participants and has been utilized in planning by the network, as well as the development of additional efforts in tribal engagement to better understand community values and perspectives related to CWD. While our study demonstrated that tribal natural resource professionals were open to and in some cases welcomed external partnerships, critical next steps for any external partner of tribes includes building trust, transparently outlining tribal-partner needs and goals, acknowledging and respecting Indigenous knowledge and labor, and working toward a long-term, mutually beneficial relationship (Matson et al., 2021; Mohammed et al., 2012). This includes, but is

not limited to, establishing memoranda of understanding on communications and work, setting up data sharing and ownership agreements that protect Indigenous knowledge, as well as obtaining proper research clearances (e.g., Institutional Review Board approval, tribal research permits, etc.) that protect these vulnerable communities.

Our study provides insights for external partners of tribal nations (e.g., state and federal natural resource agencies and managers, university researchers) related to the comanagement and control of CWD. We have identified new opportunities where external partners can support tribes in CWD outreach to affected communities, concurrently with the development of management and surveillance plans. Partners should work closely with tribal members and natural resource agencies to ensure that materials and plans specifically address the cultural aspects of the communities affected by CWD. The uniqueness of each tribal nation and the numerous ways that cervids contribute to tribal culture and communities demonstrate that a "one size fits all" approach to managing wildlife diseases is inappropriate. These recommendations are not meant to discourage necessary disease management, but to urge the incorporation of tribal knowledge, values, and priorities in order to effectively advance long-lasting wildlife conservation and disease management.

AUTHOR CONTRIBUTIONS

Marc D. Schwabenlander, Nicole Potts, and Tiffany M. Wolf led the conceptualization and writing of the article. Marc D. Schwabenlander, Seth Moore, and Tiffany M. Wolf performed the interviews and acquired the data. Marc D. Schwabenlander, Nicole Potts, and Lauren A. Bernstein analyzed the data. All authors contributed to data interpretation, conceptual development, writing, and revisions.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

These qualitative data will not be made publicly available in keeping with tribal data sovereignty rights [see T. Kukutai, J. Taylor, Indigenous Data Sovereignty: Toward an Agenda (ANU Press, 2016; https://library.oapen.org/handle/20.500.12657/31875)]. The survey instrument is available in the supplemental materials. Researchers who would like access to the data can contact the corresponding author.

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ENDNOTE

[1] While the terms Indian and Native American are often used interchangeably, we use the term Indian in this text rather than Native American based on the context provided by Pevar (2012), where Indian is often the term used in the names of Indian-led organizations and groups, federal laws and federal agencies. This terminology is conventionally used by the tribes that participated in this project.

REFERENCES

Amick, K., Clark, D., & Brook, R. K. (2015). Stakeholder perspectives on chronic wasting disease risk and management on the Canadian prairies. *Human Dimensions of Wildlife*, *20*, 408–424.

Awāsis, S. (2021). Gwaabaw: Applying Anishinaabe harvesting protocols to energy governance. *The Canadian Geographer*, *65*, 8–23.

Bennett, A. M. (2019). *Expert opinions on the potential role of indigenous peoples in wildlife management in Alberta* [Master's thesis]. University of Alberta.

Berkes, F. (2017). *Sacred ecology* (4th ed.). Routledge.

Bernstein, L. A., Schaffer, C., Walz, E., Moore, S., Sparks, A., Stone, S., Roerick, T., Larsen, P. A., & Wolf, T. M. (2021). Exploring risk for echinococcosis spillover in northern Minnesota tribal communities. *EcoHealth*, *18*, 169–181.

Brook, R. K., & McLachlan, S. M. (2008). Trends and prospects for local knowledge in ecological and conservation research and monitoring. *Biodiversity and Conservation*, *17*, 3501–3512.

Charmaz, K. (2006). Coding in grounded theory practice. In K. Charmaz (Ed.), *Constructing grounded theory: A practical guide through qualitative analysis* (1st ed., pp. 42–71). Sage Publications.

Day, S. (2020). Implications of tribal sovereignty, federal trust responsibility, and congressional plenary authority for native American lands management. In E. A. Wolters & B. S. Steel

(Eds.), *The environmental politics and policy of Western public lands* (pp. 171–182). Oregon State University.

Deere, J. R., Moore, S. A., Ferrey, M., Jankowski, M. D., Primus, A., Convertino, M., Servadio, J. L., Phelps, N. B. D., Hamilton, M. C., Chenaux-Ibrahim, Y., Travis, D. A., & Wolf, T. M. (2020). Occurrence of contaminants of emerging concern in aquatic ecosystems utilized by Minnesota tribal communities. *Science of the Total Environment*, *724*, 138057.

Deere, J. R., Streets, S., Jankowski, M. D., Ferrey, M., Chenaux-Ibrahim, Y., Convertino, M., Isaac, E. J., Phelps, N. B. D., Primus, A., Servadio, J. L., Singer, R. S., Travis, D. A., Moore, S., & Wolf, T. M. (2021). A chemical prioritization process: Applications to contaminants of emerging concern in freshwater ecosystems (phase I). *Science of the Total Environment*, *772*, 146030.

Donatuto, J. L., Satterfield, T. A., & Gregory, R. (2011). Poisoning the body to nourish the soul: Prioritising health risks and impacts in a native American community. *Health, Risk & Society*, *13*, 103–127.

Donoghue, E. M., Thompson, S. A., & Bliss, J. C. (2010). Tribal-Federal Collaboration in resource management. *Journal of Ecological Anthropology*, *14*, 22–38.

Eisenberg, C. (2019). Diversifying ecology by bridging Western science and traditional ecological knowledge. *Bulletin of the Ecological Society of America*, *100*, 1–3.

Gillin, C. M., & Mawdsley J. R. (2018). AFWA technical report on best management practices for prevention, surveillance, and management of chronic wasting disease. Association of Fish and Wildlife Agencies. https://www.fishwildlife.org/application/files/9615/3729/1513/AFWA_Technical_Report_on_CWD_BMPs_FINAL.pdf

Government of Nunavet. (2003). Wildlife Act, SNu 2003, c 26. https://canlii.ca/t/51x1n

Government of Nunavet. (2013). Implementation of Inuit Societal Values Report. https://www.gov.nu.ca/sites/default/files/2015-04-22-incorporating_inuit_societal_values_report.pdf

Gratani, M., Bohensky, E. L., Butler, J. R. A., Sutton, S. G., & Foale, S. (2014). Experts' perspectives on the integration of indigenous knowledge and science in wet tropics natural resource management. *The Australian Geographer*, *45*, 167–184.

Great Lakes Indian Fish & Wildlife Commission. (2019). Tribal CWD management. https://data.glifwc.org/download/archive.bio/Tribal%20Disease%20and%20Invasive%20Species%20Management%20Areas%20-%20Aug2019.pdf

Great Lakes Inter-Tribal Council Snap-Ed Program. (2015). Waawaashkeshi (Deer). https://glitcsnap.wordpress.com/2015/02/05/waawaashkeshi-deer/

Holton, J. A. (2007). The coding process and its challenges. In A. Bryant & K. Charmaz (Eds.), *The SAGE handbook of grounded theory* (pp. 275–277). Sage Publications.

Joly, D. O., Ribic, C. A., Langenberg, J. A., Beheler, K., Batha, C. A., Dhuey, B. J., Rolley, R. E., Bartelt, G., van Deelen, T. R., & Samuel, M. D. (2003). Chronic wasting disease in free-ranging Wisconsin white-tailed deer. *Emerging Infectious Diseases*, *9*, 599–601.

Kalt, J. P., & Singer, J. W. (2004). *Myths and realities of tribal sovereignty: The law and economics of Indian self-rule* (No. RWP04-016). Harvard University, John F. Kennedy School of Government. https://scholar.harvard.edu/files/jsinger/files/myths_realities.pdf

Lewis, J. P., & Boyd, K. (2012). Determined by the community: CBPR in Alaska native communities building local control and self-determination. *Journal of Indigenous Research*, *1*(2), 6.

Maraud, S., & Roturier, S. (2021). Chronic wasting disease (CWD) in Sami reindeer herding: The socio-political dimension of an epizootic in an indigenous context. *Animals*, *11*, 297.

Matson, L., Ng, G. H. C., Dockry, M., Nyblade, M., King, H. J., Bellcourt, M., Bloomquist, J., Bunting, P., Chapman, E., Dalbotten, D., Davenport, M. A., Diver, K., Duquain, M., Graveen, W., Hagsten, K., Hedin, K., Howard, S., Howes, T., Johnson, J., ... Waheed, A. (2021). Transforming research and relationships through collaborative tribal-university partnerships on Manoomin (wild rice). *Environmental Science and Policy*, *115*, 108–115.

McHugh, M. L. (2012). Interrater reliability: The kappa statistic. *Biochemia Medica*, *22*, 276–282.

Mohammed, S. A., Walters, K. L., LaMarr, J., Evans-Campbell, T., & Fryberg, S. (2012). Finding middle ground: Negotiating university and tribal community interests in a community-based participatory research. *Nursing Inquiry*, *19*(2), 116–127.

Mysterud, A., Benestad, S. L., Rolandsen, C. M., & Våge, J. (2020). Policy implications of an expanded chronic wasting disease universe. *The Journal of Applied Ecology*, *58*, 281–285.

Newcomer, K. E., Hatry, H. P., & Wholey, J. S. (2015). *Handbook of practical program evaluation*. John Wiley & Sons.

Otis, D. S. (2014). *The Dawes act and the allotment of Indian lands*. University of Oklahoma Press.

Parlee, B., Ahkimnachie, K., Cunningham, H., Jordan, M., & Goddard, E. (2021). 'It's important to know about this'—Risk communication and the impacts of chronic wasting disease on indigenous food systems in western Canada. *Environmental Science & Policy*, *123*, 190–201.

Petchenik, J. (2006). Landowner responses to harvest incentives in Wisconsin's southwest chronic wasting disease eradication zone. *Human Dimensions of Wildlife*, *11*, 225–226.

Pevar, S. L. (2012). *The rights of Indians and tribes* (4th ed.). Oxford University Press.

Prusiner, S. B. (1982). Novel proteinaceous infectious particles cause scrapie. *Science*, *216*, 136–144.

Richards, B. (2021). *Distribution of chronic wasting disease in North America* United States Geological Survey National Wildlife Health Center. https://www.usgs.gov/media/images/distribution-chronic-wasting-disease-north-america-0

Rivera, N. A., Brandt, A. L., Novakofski, J. E., & Mateus-Pinilla, N. E. (2019). Chronic wasting disease in cervids: Prevalence, impact and management strategies. *Veterinary Medicine*, *10*, 123–139.

Servadio, J. L., Deere, J. R., Jankowski, M. D., Ferrey, M., Isaac, E. J., Chenaux-Ibrahim, Y., Primus, A., Convertino, M., Phelps, N. B. D., Streets, S., Travis, D. A., Moore, S., & Wolf, T. M. (2021). Anthropogenic factors associated with contaminants of emerging concern detected in inland Minnesota lakes (phase II). *Science of the Total Environment*, *772*, 146188.

US Commission on Civil Rights. (2003). *A quiet crisis: Federal funding and unmet needs in Indian country*. United States Commission on Civil Rights. https://www.usccr.gov/files/pubs/na0703/na0204.pdf

US Department of Interior. (2014). Order No. 3335: Reaffirmation of the federal trust responsibility to federally recognized Indian tribes and individual Indian beneficiaries. United States Department of Interior. https://www.doi.gov/sites/doi.gov/files/migrated/news/pressreleases/upload/Signed-SO-3335.pdf

USDA, APHIS. (2002). Plan for assisting states, federal agencies, and tribes in managing chronic wasting disease in wild and captive cervids. United States Department of Agriculture, Animal and Plant Health Inspection Service. http://cwd-info.org/wp-content/uploads/2019/03/Federal-Plan-for-Assisting-States-Federal-Agencies-and-Tribes-2002.pdf

Van de Vuurst, P., Moore, S. A., Isaac, E. J., Chenaux-Ibrahim, Y., Wolf, T. M., & Escobar, L. E. (2021). Reconstructing landscapes of ungulate parturition and predation using vegetation phenology. *Current Zoology*, *XX*, zoab058. https://doi.org/10.1093/cz/zoab058

Williams, E. S., & Miller, M. W. (2002). Chronic wasting disease in deer and elk in North America. *Revue Scientifique et Technique*, *21*, 305–316.

Williams, E. S., & Young, S. (1980). Chronic wasting disease of captive mule deer: A spongiform encephalopathy. *Journal of Wildlife Diseases*, *16*, 89–98.

Wolf, T. M., Chenaux-Ibrahim, Y. M., Isaac, E. J., Wünschmann, A., & Moore, S. A. (2021). Neonate health and calf mortality in a declining population of North America moose (*Alces alces americanus*). *Journal of Wildlife Diseases*, *57*(1), 40–50.

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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Chronic Wasting Disease

What is Chronic Wasting Disease?

Chronic Wasting Disease (CWD) is a contagious, fatal brain disease affecting wild and farmed cervids such as deer, moose, elk, caribou, and reindeer. CWD belongs to a family of diseases called prion diseases or transmissible spongiform encephalopathies (TSEs). Other TSEs include bovine spongiform encephalopathy (i.e., mad cow disease) in cattle, scrapie in sheep and goats, and Creutzfeldt-Jakob disease in people. Prion diseases are always fatal.

Where does CWD come from?

The disease is caused by prions, protein material within a deer, that, when folded incorrectly, become infectious. Prions survive for long periods of time in the environment, and they are spread through an infected animal's saliva, blood, feces, urine, and antler velvet. The remains of an animal that dies from CWD can become a source for new infections, contaminating the local environment.

Where is CWD found?

As of May 2023, CWD in wild and farmed cervids has been reported in 30 states in the United States, as well as in Canada, Norway, Finland, Sweden, and South Korea. CWD is spreading throughout the upper Midwest including North Dakota, South Dakota, Nebraska, Iowa, Illinois, Wisconsin and Minnesota. There are several areas in Minnesota where CWD has been detected in wild white-tailed deer (see below). The majority of CWD-infected animals have been found in the southeastern part of the state.

What is being done to stop the spread of CWD?

Experts from the University of Minnesota are currently working on developing faster diagnostic tests, researching the way CWD spreads, and analyzing the ecological impacts of the disease.

The Minnesota Department of Natural Resources and the Minnesota Board of Animal Health are surveying and managing CWD in Minnesota and are working to limit its spread in wild and farmed cervids across the state.

What are the clinical signs of CWD?

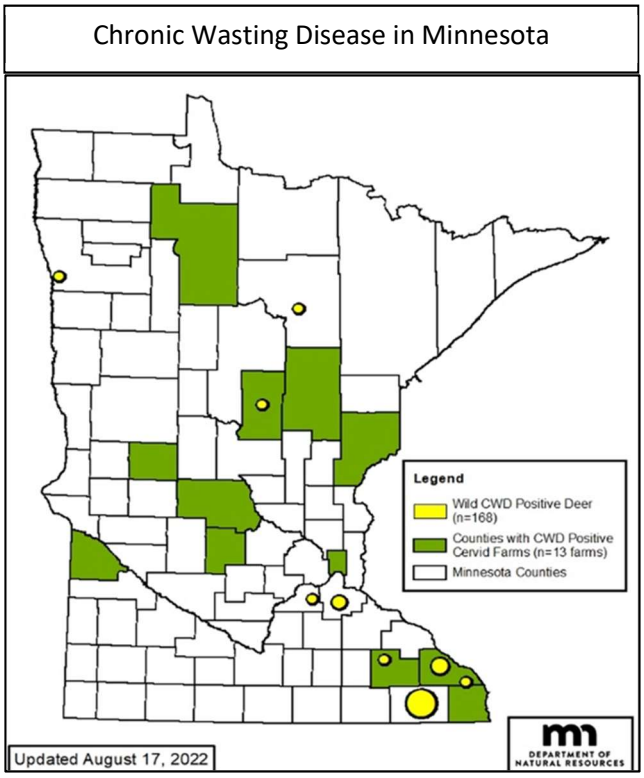
It may take over a year before an infected deer develops clinical signs, during which time they appear healthy. Clinical signs can include drastic weight loss (wasting), stumbling, inactivity and loss of fear of humans. Specifically, deer become thin, drink and urinate excessively, have poor balance & coordination, lack body fat, have drooping ears, and difficulty swallowing. Inability to swallow leads to pneumonia and death.

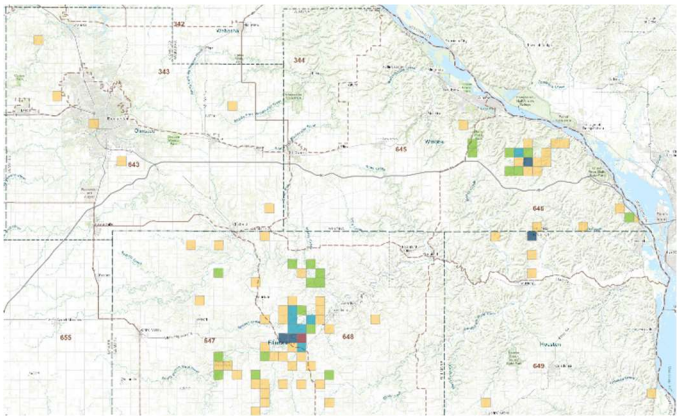
Is there a treatment for CWD?

Unlike other animal diseases, there is no vaccine or treatment for CWD and they do not develop immunity to infection. CWD is always fatal in deer.

What should I do if I see a sick deer?

Please report sick deer by calling 888-646-6367





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For venison consumers - *know the risks*

Can CWD be transmitted to humans?

Currently, there is no direct evidence that CWD poses a risk for humans; however, it is recommended that people do not consume meat from animals known to be infected. While CWD has not been shown to infect humans, bovine spongiform encephalopathy (i.e. mad cow disease), another prion disease, is able to infect humans. In experiments CWD has been able to infect other animal species. Because of the long time from infection to signs of disease, it is difficult to determine if CWD poses a risk to humans.

Because we do not yet know the full risk that CWD poses to humans, it is important to avoid eating meat from CWD-infected animals. CWD most often concentrates in the brain and spinal cord but can be found in other parts of the body, including muscle. Determine if the venison you consume was harvested in a CWD management area. If so, wait for CWD "not detected" test results before consuming the meat or avoid consuming the meat if the deer was not tested. The prions that cause CWD are very resistant to heat and freezing temperatures. Cooking or freezing the meat will not remove prions from infected meat.

For hunters - *reduce the spread*

What are the CWD regulations?

Minnesota DNR's CWD regulations are an important part of reducing the risk of disease spread across Minnesota and into other states. The CWD regulations can change from year to year as new information is obtained. Carefully read the regulations prior to every hunting season. Current regulations for testing, carcass movement, and feeding bans can be found in hunting regulation handouts at licensing centers and from the Minnesota DNR.

What precautions should be taken?

Hunting and Processing

Wear disposable latex gloves when field dressing and butchering your deer. Bone out meat from your animal and minimize handling of brain and spinal tissue. Use dedicated knives for harvesting and processing deer. Wash your hands and disinfect all butchering and processing knives and tools with a 40% bleach solution for 30 minutes.

Consider having your deer processed and wrapped individually, either privately or commercially, so as not to mix CWD-positive and CWD-"not detected" deer meat. When processing your deer, it is important to identify and remove lymph nodes. Lymph nodes accumulate pathogens including prions, the disease causing agent of CWD.

Please report any sick deer by calling 888-646-6367.

Carcass Movement and Disposal

Moving infected animals (dead or alive) can spread CWD. Properly move and dispose of deer carcasses and processing waste per Minnesota DNR regulations.

Whole carcasses of deer from CWD management or control zones have special regulations to limit movement. The only parts which can leave these areas before a "not detected" test result are:

- Quarters or other portions of meat with no part of the spinal column or head attached; the main leg bone can remain in each quarter
- Meat that is boned out or that is cut and wrapped (either commercially or privately)
- Hides and teeth
- Antlers or clean (no brain tissue attached) skull plates with antlers attached

Carcass Movement and Disposal, cont.

General disposal options, in order of preference are:

- Provided dumpsters in CWD zones
- Household waste streams going to landfills
- Leave on the landscape where deer was harvested

Disinfection

CWD prions can be removed from stainless steel surfaces (i.e., knife blades, processing tables, etc.) by using a 1:1 water to household bleach solution and a 5-minute soak. Rinse tools and surfaces after bleaching. Always follow the appropriate safety precautions when handling bleach.

Testing

Consider having your deer tested, even if it is not mandatory in your hunting zone. This can be done at staffed sampling stations or at self-service sampling stations. Trophy deer can still be tested through participating taxidermists. Consider not eating your deer meat until CWD test results are determined to be "not detected." For sample results visit https://www.dnr.state.mn.us/cwdcheck/index.html

Or call 1-888-646-6367
8 am – 6pm weekdays, or
8 am – 4:30 pm on Saturday

Sample results are usually available in 10 – 14 business days but can be longer during busy times.

For landowners - *be good stewards*

What if CWD is found on my property?

Cooperate with Minnesota DNR and/or BAH officials to better understand the extent of disease on the landscape. The 3D shape of CWD prions makes them almost indestructible. This durability facilitates the spread of prions in the surrounding environment through many avenues, including water, soil, and plants. MNPRO is initiating cutting-edge research on the spread of CWD in the complex ecosystems across Minnesota.

What's happening in Minnesota?

Stay up-to-date on CWD in Minnesota through the Minnesota Department of Natural Resources (DNR), the Minnesota Board of Animal Health (BAH), and the Minnesota Center for Prion Research and Outreach (MNPRO).

- DNR – 651-296-2942 https://www.dnr.state.mn.us/cwd/index.html
- BAH – 888-646-6367 https://www.bah.state.mn.us/news_release/
- MNPRO – 612-626-1694 https://mnpro.umn.edu/

To reach local Conservation Officers call the DNR information center at 888-646-6367.

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