TWRA CHRONIC WASTING DISEASE
RESPONSE PLAN

[This CWD Response Plan is a “living document”, which reflects the ongoing efforts of the Tennessee Wildlife Resources Agency to use the most up to date and effective measures to prevent and manage the potential introduction of Chronic Wasting Disease into Tennessee. The CWD Response Plan will be updated and revised on a regular and continuing basis, as new information on CWD management and control become available.]
Contents

Executive Summary................................................................................................................1

I. Introduction..........................................................................................................................2
   Overview of Chronic Wasting Disease ................................................................................2
   Chronological Overview of TWRA’s Response to the Threat of CWD..............................4
   Authorities............................................................................................................................7

II. Pre-detection Preparation................................................................................................8
   Regulatory Actions ..............................................................................................................8
   Surveillance Sampling..........................................................................................................9

III. Response to a CWD Positive..........................................................................................10
   Notification Process...........................................................................................................10
   Response Teams................................................................................................................11
   Management Actions..........................................................................................................11
      Wild Cervids....................................................................................................................12
      Captive Cervids................................................................................................................13
      Adjacent States with a Confirmed CWD Positive............................................................14

IV. Communications Strategy...............................................................................................14
   Pre-Detection Communications.........................................................................................15
   Post-Detection Communications.......................................................................................17
      Internal..............................................................................................................................17
      External............................................................................................................................17

V. Costs of Implementing this plan......................................................................................17

Literature Cited .....................................................................................................................19
Appendix A: Tennessee CWD Risk Assessment and Surveillance Plan

Appendix B: Tennessee Chronic Wasting Disease Herd Certification Program

Appendix C: Supplies Needed for Collecting CWD Samples

Appendix D: Additional Supplies, Equipment and Facilities Needed for CWD Response

Appendix E: TWRA Notification Sequence for Preliminary Chronic Wasting Disease Positive

Appendix F: TWRA Notification Sequence for a Confirmed Positive Chronic Wasting Disease Test

Appendix G: TWRA Chronic Wasting Disease Media Team

Appendix H: TWRA Chronic Wasting Disease Administrative Team

Appendix I: TWRA Chronic Wasting Disease Response Team
Executive Summary

Chronic Wasting Disease (CWD) is a transmissible, fatal, neurological disease affecting members of the Cervidae (deer) Family. Common members of this family include white-tailed deer (*Odocoileus virginianus*), elk (*Cervus elaphus canadensis*), mule deer (*Odocoileus hemionus*), moose (*Alces alces*), caribou (*Rangifer tarandus*), red deer (*Cervus elaphus elaphus*), and fallow deer (*Dama dama*). Wild free-ranging members of the deer family found in Tennessee include white-tailed deer and elk. Currently, there are no known cases of CWD transmission to humans (Belay et al. 2004). However, the Centers for Disease Control (CDC) recently published guidance on human handling of venison harvested from areas with CWD, recommending that hunters submit a sample of their deer or elk harvested from a CWD endemic area for CWD testing prior to consuming the venison and avoiding consumption of known positive animals.

In the late 1960’s, CWD was first recognized in captive mule deer in Colorado. The disease has since been detected in Arkansas, Illinois, Iowa, Kansas, Maryland, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Mexico, New York, North Dakota, Ohio, Oklahoma, Pennsylvania, South Dakota, Texas, Utah, Virginia, West Virginia, Wisconsin and Wyoming. Additionally, CWD is present in the Canadian provinces of Alberta and Saskatchewan.

Monitoring for CWD in Tennessee began in 2002. To date, 12,282 free-ranging deer and 109 free-ranging elk have been tested for the disease. CWD has not been detected in Tennessee, but it remains crucial for the Tennessee Wildlife Resources Agency (TWRA) to remain vigilant in its efforts to keep the disease out of Tennessee, and continue sampling efforts to ensure early detection if it were to occur in the state. Additionally, appropriate and immediate actions will be warranted to limit the negative impacts of CWD if ever found in Tennessee.

The TWRA recognizes that CWD in Tennessee would have significant biological, ecological, economic and sociological implications. CWD represents a serious long-term threat to cervid populations in the state. The purpose of this response plan is to provide direction, guidelines and a specific course of action for monitoring and managing CWD in Tennessee, if it were to occur. This plan outlines four over-arching goals aimed at preventing and minimizing the impacts of CWD on native deer and elk populations in Tennessee:

- **Prevention**
  - Employ appropriate preventive measures to minimize the risk of CWD entering the state.
- **Early Detection**
  - Implement appropriate sampling strategies (methodologies, sample size and location) throughout the state to ensure early detection.
• Containment
  o Implement appropriate monitoring strategies to determine prevalence and spatial distribution of CWD, if detected.
  o Employ appropriate management actions that will limit the spread of CWD and eliminate or maintain the disease at a low prevalence, if detected.
  o Determine the origin of any CWD positive cervid.

• Communications
  o Distribution of accurate and effective information on CWD to the public, Agency staff, the Tennessee Fish and Wildlife Commission (TFWC) and other stakeholders.

Accomplishing these goals will minimize the impact of CWD on native white-tailed deer and elk in the state. The management of CWD will require a long-term commitment and adaptive approach that will be continually refined as the science of CWD detection and management advances.

Once established, eradication of CWD is unlikely due to the persistence of prions (the infectious agent) in the environment (Williams and Miller 2002). The TWRA CWD Response Plan focuses on prevention, early detection and control of the disease. In the event that CWD is detected in Tennessee, our plan provides details on TWRA actions that will be undertaken to contain and monitor the disease within a defined area. The Plan identifies response and support teams, with specific roles and responsibilities outlined. It also outlines internal and external notification procedures, as well as a Communications Strategy that will be employed throughout the different stages of CWD management. In operationalizing the plan, TWRA will seek the development of partnerships with private citizens and other governmental agencies to manage CWD if it were to occur in Tennessee.

1. INTRODUCTION

Overview of Chronic Wasting Disease

Chronic Wasting Disease (CWD) is a transmissible, fatal, neurological disease affecting members of the Cervidae (deer) Family. The agent for this disease is neither bacterial nor viral, and is caused by misfolding of a normal prion protein that replicates and causes other normal prion proteins to misfold (Fryer and McLean 2011). This neurological disease is in the family of infectious diseases known as transmissible spongiform encephalopathies (TSEs). Other TSEs include bovine spongiform encephalopathy (BSE) in cattle (i.e., mad cow disease), scrapie in sheep, feline spongiform encephalopathy in cats, and Creutzfeldt-Jakob disease (CJD) and variant (vCJD) in humans.
CWD is named for the symptoms caused by the disease which include: excessive salivation, appetite loss, weight loss, and behavioral changes (Williams 2005). Diagnosis of the disease cannot be made based on clinical symptoms alone, since other diseases (e.g., epizootic hemorrhagic disease) can cause the animal to exhibit similar symptoms. There is currently no USDA-approved, live-animal test for CWD. The preferred test to diagnose CWD is the enzyme-linked immunobeaded assay (ELISA) test, which uses fresh tissue and typically has a 1-3 day turn-around for results, depending on the capacity of the diagnostic laboratory. A positive ELISA test for CWD must be confirmed via the immunohistochemistry (IHC) method, which measures accumulations of CWD-associated prion protein in brain and lymph node tissues. Incubation periods in naturally-exposed, free-ranging deer are difficult to determine, but average incubation periods are thought to be 2 to 4 years but can vary greatly (Williams 2005). From the time clinical symptoms are identified, death occurs within several months (Williams et al 2002). Research on wild white-tailed deer found females infected with CWD died within 2.6 years and infected males died within 2.1 years (Edmunds et al. 2016); infected mule deer survived 1.6 years while uninfected mule deer survived 5.2 years (DeVivo et al. 2017).

The United States Center for Disease Control and Prevention and the World Health Organization have reviewed available scientific data and conclude currently there are no reported cases of CWD transmission to humans (https://www.cdc.gov/prions/cwd/index.html). However, in an effort to exercise abundant caution on the potential human health consequences, CDC recently published guidance on human handling of venison harvested from areas with CWD. They now recommend that hunters harvesting a cervid (deer and elk primarily) from a CWD endemic area submit a sample of their animal for CWD testing prior to consuming the venison, and to not consume animals known to be positive.

CWD was first detected in mule deer at the Colorado Division of Wildlife captive wildlife research facility in Fort Collins in 1967. The first documented case of CWD in a free-ranging cervid was in 1981 in a Colorado elk. The disease has since been detected in Arkansas, Illinois, Iowa, Kansas, Maryland, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Mexico, New York, North Dakota, Ohio, Oklahoma, Pennsylvania, South Dakota, Texas, Utah, Virginia, West Virginia, Wisconsin and Wyoming. Additionally, CWD is present in the Canadian provinces of Alberta and Saskatchewan (Figure 1).

There are two primary forms of exposure to CWD for uninfected cervids: CWD infected cervids or from a CWD-contaminated environment (Williams et al. 2002, Miller et al. 2004, Mathiasson et al. 2009). In areas where CWD is not established and where the environment is relatively uncontaminated, direct animal contact may be the most likely source of transmission of CWD. 

---

1 Center for Disease Control Guidelines for consumption of venison harvested from areas with Chronic Wasting Disease (Source: https://www.cdc.gov/prions/cwd/prevention.html).
CWD to uninfected cervids (Arkansas Game & Fish Commission 2016). However, as CWD becomes established in an area, environmental contamination could become the primary source of infection (Almberg et al. 2011) as the number of CWD prions increases in the area.

Figure 1. Distribution of Chronic Wasting Disease in North America, December 2018 (USGS National Wildlife Health Center, https://www.usgs.gov/centers/nwhc/science/expanding-distribution-chronic-wasting-disease?qt-science_center_objects=0#qt-science_center_objects)

**Chronological Overview of TWRA’s Response to the Threat of CWD**

Beginning in 2002, due to increasing national concerns over CWD and the serious nature of the disease, Tennessee Wildlife Resources Agency (TWRA) began CWD monitoring of white-tailed deer and elk. By 2018, a total of 12,282 free-ranging white-tailed deer and 109 free-ranging elk have been tested for the disease. In fall of 2016, a new pilot strategy was implemented, to significantly increase the number of samples obtained on an annual basis. The new approach was to enlist the assistance of taxidermists and game processors, paying them to collect samples. In 2016 and 2017, sample sizes for CWD testing increased by more than 590% (2,014 and 1,799 samples in 2016 and 2017, respectively) (Table 1). As of 2018, CWD has not been detected in Tennessee.
In 2018, TWRA implemented an enhanced surveillance strategy (Appendix A), which is designed to both assess the risk of CWD introduction into Tennessee, and implement a weighted sampling strategy that integrates deer population and key risk factors. The overall goal of this new surveillance approach is to maximize the chances of early detection of CWD.

It is well documented that the movement of infected, live cervids and infected carcasses by humans has resulted in broad geographic expansion and distribution of CWD. Fortunately, the TWRA has implemented various regulations helping to minimize these threats. In 2009, the TWRA adopted regulations imposing a moratorium on new facilities possessing and/or harvesting big game species under the authority of a Private Wildlife Preserve Permit (Appendix B). The regulation requires that Cervidae being held or harvested in wildlife preserves are “obtained from a herd outside of the state that has been certified as Chronic Wasting Disease free for the past 5 years, and are authorized for import by the Tennessee Department of Agriculture” (TDA). Cervidae may also be obtained from a source within the state of Tennessee which is enrolled in the TDA CWD Herd Certification Program. TDA established the Tennessee CWD Herd Certification Program (Appendix B), in compliance with the U.S. Dept. of Agriculture’s CWD Herd Certification Program, to provide a mechanism for the importation of live non-native cervids, while reducing the risk of introducing CWD into the state of Tennessee.

---

There is growing evidence, however, that the USDA CWD Herd Certification Program is ineffective in minimizing the risks of CWD transmission, and states should seriously consider prohibiting the importation of all live CWD-susceptible cervids (Association of Fish & Wildlife Agencies 2018).

In 2012, the TWRA adopted a regulation that no person may import, transport, or possess a cervid carcass or part from any CWD positive area unless it meets certain criteria that prevent introduction of prions from CWD positive areas. In 2018, these restrictions on cervid carcass transport were expanded to include any area outside Tennessee\(^3\). Also, in 2018 the TFWC approved regulations to prohibit the use or possession of cervid urine (except synthetic) products while hunting. This prohibition will take effect in March 2019\(^4\). The statewide prohibition on possession of live white-tailed deer also helps in limiting the threat of CWD in Tennessee\(^5\).

The TWRA recognizes CWD in Tennessee would have significant biological, ecological, economic and sociological implications. CWD represents a serious long-term threat to cervid populations in the state. The purpose of this response plan is to provide direction, guidelines and a specific course of action for monitoring and managing CWD in Tennessee, if it were to occur.

This plan outlines four over-arching goals aimed at preventing and minimizing the impacts of CWD on native deer and elk populations in Tennessee:

- **Prevention**
  - Employ appropriate preventive measures to minimize the chances of CWD entering the state.

- **Early Detection**
  - Implement appropriate methodologies and levels of sampling strategies (methodologies and sample size) throughout the state to ensure early detection.

- **Containment**
  - Implement appropriate monitoring strategies to determine prevalence and spatial distribution of CWD, if detected.
  - Employ appropriate management actions that will limit the spread of CWD and eliminate or maintain the disease at a low prevalence, if detected.
  - Determine the origin of any CWD positive cervid.

- **Communications**
  - Distribution of accurate and effective information on CWD to the public, Agency staff, the Tennessee Fish and Wildlife Commission (TFWC) and other stakeholders.

---


\(^5\)Tennessee Code Annotated, Title 70, Chapter 4 - [70-4-403](https://en.wikipedia.org/wiki/Title_70)
Accomplishing these goals will minimize the impact of CWD on white-tailed deer and elk in the state. The management of CWD will require a multi-year adaptive management approach that can be refined as the science of CWD detection and management advances.

Prevention is the only cure for CWD due to the persistence of prions (the infectious agent) in the environment (Williams and Miller 2002). This plan focuses on prevention, early detection and control of the disease with major efforts focused on containing the disease and monitoring its prevalence within a defined area.

Response and support teams are identified with specific responsibilities outlined. The TWRA will rely on partnerships with private citizens and other governmental agencies to manage CWD if it were to occur in Tennessee.

Authorities

*Tennessee Wildlife Resources Agency*

Tennessee Code Annotated Title 70 provides the overall authority to the TWRA for all native wildlife (e.g., white-tailed deer, wild elk, etc.) and its management, conservation, protection and propagation. Pursuant to TCA 70-1-302(a)(5), the Agency has the authority to exercise control measures of undesirable species.

Pursuant to TCA 70-4-107, the Tennessee Fish and Wildlife Commission (TFWC) has the authority to issue proclamations in order to set seasons, manner, means, etc. TCA 70-4-107(c)(3) authorizes the Commission to summarily close, reopen and/or extend seasons during emergency conditions.

Additionally, pursuant to TCA 70-4-113 the Executive Director and his designees have the authority to use any device to capture or kill any animal for specific purposes, or when it is considered necessary by the Executive Director to reduce or control any species that may be detrimental to human safety, health or property.

Importation and possession of live white-tailed deer is illegal in Tennessee. However, white-tailed deer may be incidentally contained within a property with high enough fencing to prevent escape and there is no restriction on high-fencing of properties. Although white-tailed deer are likely contained within these properties, the ownership of these deer remains with the state. TWRA is also responsible for permitting private big game wildlife preserves, but the regulatory authority for cervids other than white-tailed deer in these enclosures rests with the Tennessee...
Department of Agriculture (TDA)\(^6\). Currently, there is a moratorium on the establishment of new private big game wildlife preserves.

*Tennessee Department of Agriculture*

Importation and possession of live cervids, other than white-tailed deer and wild elk, is legal in Tennessee. The TDA, including the State Veterinarian, has regulatory authority over these activities. More specifically, the State Veterinarian has authority over sanitary disposal of any dead animal, and disease related issues with all live animals. Furthermore, the State Veterinarian can order vaccination, quarantine and destruction of any animal.

It is not entirely known how many captive cervid facilities exist in the state since they are not required to be registered or permitted unless they are involved in interstate movement of CWD-susceptible cervids. Operators of cervid facilities involved in interstate movement of CWD-susceptible species are required to participate in TDA’s CWD Herd Certification Program (HCP) (Appendix B). Participating in the CWD HCP is voluntary for those facilities not involved in interstate movement of Cervidae. Therefore, some captive cervid facilities are unknown by TDA and TWRA. As a result, TWRA is working to identify the locations of all captive cervid facilities in Tennessee and map them to assist with CWD prevention and/or control efforts.

*United States Department of Agriculture Veterinary Services*

If CWD is found in a captive cervid herd, the United States Department of Agriculture (USDA) Veterinary Services will work in concert with the State Veterinarian to develop a herd plan outlining protocol for animal movement into and out of the facility and possible euthanasia, disposal, indemnity, etc. In a case where white-tailed deer have been incidentally contained within a CWD-positive captive cervid facility, TWRA will work with USDA and the State Veterinarian to properly manage these whitetails following a USDA herd plan.

**II. PRE-DETECTION PREPARATION**

**Regulatory Action**

There is no vaccination or treatment for CWD, thus prevention is the first and most effective strategy for minimizing the chances of CWD becoming established in Tennessee. TWRA has implemented several regulatory mechanisms to minimize the chances that a CWD-positive animal (live or dead) will be brought into the state. First, as noted previously, the importation and possession of live white-tailed deer and wild elk into Tennessee is prohibited by state statute

---

\(^6\) Tennessee Code Annotated, Title 70, Chapter 4 - 70-4-403
Second, TWRA regulates the shooting of captive cervids on Private Wildlife Preserves. Since 2009, a moratorium has been placed on the establishment of new big game wildlife preserves. Third, TWRA restricts the transportation of cervid carcasses from areas outside Tennessee to include only a) meat that has bones removed; b) antlers, antlers attached to cleaned skull plates, or cleaned skulls; c) cleaned teeth; d) finished taxidermy and antler products; e) hides and tanned products. Finally, TWRA established regulations to prohibit the use or possession of cervid urine, except synthetic, for hunting, to become effective March 1, 2019.

If CWD is detected in Tennessee, TWRA will shift its focus to active monitoring and containment of the disease in the area where the detection is made (Note: CWD surveillance activities will continue in the remainder of the state, in an effort to maintain an early detection system for CWD). The following regulatory options will be considered as strategies to minimize its prevalence in the population and to contain its spread:

- A ban on feeding and rehabilitating wild cervids in defined TWRA CWD Management Zone (CMZ).
- Ban on removal of cervid carcasses and parts from defined TWRA CWD Management Zone.
- Mandatory sampling of hunter-harvested deer and elk from within TWRA CWD Management Zone at physical checking stations.
- Increase deer bag limits, extended deer seasons and/or allow additional weapon types in TWRA CWD Management Zone(s).
- TWRA-sanctioned culling actions in TWRA CWD Management Zone.
- Mandate disposal requirements for hunter-killed cervids taken in TWRA CWD Management Zone.

**Surveillance Sampling**

The TWRA Disease Coordinator will be responsible for keeping an inventory of equipment and supplies for CWD sampling (Appendix C) and a CWD response (Appendix D). These items will be distributed to field staff as needed or upon request.

**Pre-CWD**

To facilitate TWRA’s goal of early detection of CWD, sampling efforts is incorporating a risk-based weighted surveillance strategy that takes into account 1) TWRA biologists’ perceptions of risk factors, 2) surrounding states’ surveillance, regulations, and CWD status, and 3) a framework for future CWD sampling (Appendix A). Obex and retropharyngeal lymph node samples will be taken from elk, while only retropharyngeal tissues will be collected from white-tailed deer. If a sufficient number of samples cannot be obtained by TWRA alone in some areas,
taxidermists and meat processors receiving cervids and/or cervid parts from these areas may be enlisted to provide additional animals for sampling.

Early detection of CWD can also be enhanced by focusing more intensive sampling on reportedly sick deer and elk. To facilitate this and increase awareness of sick deer and elk, the Agency will encourage the public to report cervids appearing unhealthy and whenever possible, these animals will be sampled and tested. In cases where sampling cannot occur, the location of the reportedly sick cervid will be documented.

Post-CWD

In the event of a confirmed positive detection of CWD, enhanced sampling will commence in a defined CWD Management Zone, with sampling procedures similar to those outlined in Appendix A. The TWRA Wildlife Disease Coordinator, TWRA Wildlife Veterinarian, and CWD Response Team leader (i.e., Asst. Chief of Wildlife & Forestry) will consult on the appropriate sample size and methodologies for obtaining samples, depending on the situation, within the CWD Management Zone. The purpose of this monitoring will be to establish a baseline prevalence rate and distribution of CWD within the CWD Management Zone.

III. RESPONSE TO A CWD POSITIVE

Notification Process

The TWRA Disease Coordinator and/or UT/TWRA Wildlife Veterinarian, upon receiving notification of a preliminary CWD positive sample from a USDA-approved laboratory, will ensure key personnel within the Agency and the Tennessee Fish and Wildlife Commission (TFWC) are notified. This will include but not be limited to the Executive Director, the Assistant Director of Field Operations, the Chief of the Wildlife and Forestry Division (WFD), the Chief of the Boating and Law Enforcement Division, the Deer and Elk Program Leaders, and Captive Wildlife Program Coordinator, the Regional Wildlife Program Managers, the Chairman of the TFWC, and the Chairman of the Wildlife Management Committee of the TFWC (Appendix E). The above mentioned personnel will be made aware that a preliminary positive case of CWD has been found in Tennessee via ELISA test and a confirming IHC test is being conducted at the USDA Veterinary Services Laboratory in Ames, Iowa. If the confirmatory test results in a non-detect finding, no further action besides proper notifications will be taken. If the original sample is insufficient for a confirmatory test, the initial positive test will be accepted as a positive for an index case.

Upon notification of a confirmed positive CWD test result by a USDA-approved laboratory, the TWRA Disease Coordinator will immediately notify the Executive Director, the Chief of the
Wildlife & Forestry Division and the Assistant Director of Field Operations; intradepartmental notification will proceed as outlined in Appendix F. The TWRA Executive Director will notify the Governor’s Office, all TFWC members, the Commissioner of Agriculture, the Commissioner of the Department of Health, the Commissioner of the Department of Environment and Conservation, the Tennessee State Veterinarian, and the U.S. Fish and Wildlife Service. Concurrently, the Assistant Director of Field Operations’ designees will notify the relevant Agency partners and the wildlife chiefs in bordering states. Also, TWRA’s Legislative Liaison will contact legislators in district(s) where the CWD-positive case occurred, prior to a statewide news release being distributed by TWRA’s Chief of Communications and Outreach. The news release will include a media packet providing background information on CWD, a synopsis of TWRA’s CWD sampling efforts, and any other CWD-related materials deemed appropriate.

The Chief of the Wildlife & Forestry Division and Chief of Communications and Outreach and/or their designees will be assigned as TWRA CWD media contacts through which all CWD-related questions from the public and the media will be routed, including public appearances and interviews. These persons will comprise the TWRA’s CWD Media Team (Appendix G). The Media Team will develop and use specific talking points when interacting with the media and members of the public about CWD. Along with TWRA staff, TFWC members should also direct media related requests and public inquiries to the TWRA Media Team. The Media Team is also responsible for TWRA’s social media communication regarding CWD. Other TWRA staff and TFWC members should refrain from posting/commenting on CWD matters and leave all CWD-related communications to the Media Team. Lastly, the Media Team is responsible for coordinating well-advertised CWD public meetings to be held in the area of the CWD detection.

Response Teams

The Assistant Director of Field Operations or their designee will serve as the CWD Administrative Team Leader (Appendix H). Additional Agency leadership will serve on the CWD Administrative Team to support the Field Response Team’s (Appendix I) activities. The CWD Administrative Team leader will immediately activate the CWD Field Response Team upon positive confirmation of CWD in the state. The CWD Field Response Team may include cervid collection teams, carcass transport teams, and biological data collection teams. The CWD Field Response Team will be led by the Assistant Chief of the Wildlife & Forestry Division and will include appropriate field staff, as deemed necessary for the specific situation and response (Appendix I).

Management Actions

Once established, eradication of CWD from a locality is difficult due to the persistence of prions in the environment. Therefore, once a CWD-positive is detected in Tennessee or in an
area within 25 miles of the border, TWRA will initiate its response efforts focused on determining the prevalence and distribution of CWD within a defined CWD Management Zone. The goals of these efforts will be containment and management of the disease, including eradication if feasible. There are at least 3 likely scenarios of CWD detection in Tennessee that would precipitate management actions by TWRA: 1) Detection in a free-ranging white-tailed deer or elk within the borders of Tennessee; 2) Detection in a captive cervid facility within Tennessee, and; 3) Detection in a free-ranging or captive cervid in an adjacent state, within 25 miles of the Tennessee border.

_Detection in a free-ranging wild cervid within the borders of Tennessee:_

- Once CWD has been confirmed in a wild cervid, a CWD Management Zone (CMZ) will be developed. The Management Zone will be comprised of a Core Zone (approximately 5-mile radius), a 10-mile High Risk Zone, and a 25-mile Buffer Zone (Figure 2).
- The Field Response Team will obtain all supplies and materials needed to conduct field activities from the respective TWRA regional office, or supplies will be drop shipped to the specific location where needed.
- A CWD Monitoring Strategy will be employed, with the objective of determining the prevalence and distribution of the disease within the CWD Management Zone.
- Special regulations for the CMZ may be adopted by the TFWC, as indicated in _Regulatory Actions_ (pages 8-9). For example, if the first positive occurs during an archery-only or muzzleloader/archery deer hunting season, a special gun hunting season may be utilized to supplement harvest and CWD sampling in the CMZ. To help facilitate sample collection during deer hunting seasons, mandatory check stations may be established within the CMZ.
- Hunter-harvested deer within the CMZ will be sampled, and individually identified. CWD test results will be available to hunters once they are finalized and accessible by the Agency.
- If needed, processors and taxidermists within the CMZ will be recruited to obtain additional biological samples of harvested cervids for CWD testing.
- If needed, additional testing within the CMZ will commence as soon as possible. The Field Response Team will contact private landowners obtaining permission to access private lands within the CMZ to secure additional samples through TWRA collection operations. Agency staff will also coordinate with managers of any public lands within the CMZ to obtain access and samples as needed. Samples will also be collected from road-killed specimens, and sampling of sick or cervids found dead.
- All sampling locations will be recorded using GPS coordinates and entered into a GIS database maintained by TWRA’s GIS staff.
- If an additional positive animal(s) is identified within the CMZ, the CMZ will be expanded as appropriate to ensure that all areas of potential CWD presence are included.
in the CMZ. Consultation with the TWRA Wildlife Veterinarian, TWRA Wildlife Disease Coordinator, Tennessee State Veterinarian, and others will help to determine the appropriate size and extent of the CWD Management Zone.

- The CWD Response Team will coordinate with the TDA and USDA to conduct inspections and monitoring of all captive cervid facilities within a CWD Management Zone.
- Response efforts will be scaled back if additional positives are not detected after five full sampling seasons following the last positive detected. Appropriate hunting regulations during and after the 5-year response period will be determined by the TWRA based on the estimated cervid population size at that time.

Figure 2. Example CWD Management Zone (with 5-mile Core Zone, 10-mile High Risk Zone, and 25-mile Buffer Zone), and counties.

Detection in a captive cervid facility within Tennessee:

Captive cervids (excluding incidentally fenced white-tailed deer) are regulated by the TDA and USDA. However, a CWD-positive cervid from a captive facility will activate TWRA’s CWD Response Plan, with the CWD-positive captive facility serving as the center point of the Core Zone and CMZ. We recommend the following actions be considered/taken by the appropriate partners if CWD is detected in a captive cervid facility within Tennessee, or if a captive cervid facility has transferred or received cervids within the past 5 years from an out-of-state captive facility in which CWD is detected:
● TDA and/or USDA ensure fences are maintained to avoid possible escapes. Additionally, recommend double fencing to exclude wild cervids from direct contact with cervids inside the enclosure.
● Immediate quarantine of the facility to ensure no cervid movement in or out of the enclosure.
● Depopulation and sanitary disposal of all cervids in the facility and decontamination of the facility to the maximum extent possible. TWRA may depopulate and test any incidentally contained white-tailed deer.
● Epidemiological investigation of cervids in contact with CWD infected animals to determine the origin and prevent further infection.
● If records indicate a captive cervid from such a facility leaves Tennessee, then the final destination state wildlife agency will be notified along with other relevant agencies.
● If the facility is a shooting preserve, shooters who may have killed any cervids within the facility will be notified that the facility tested positive for CWD.
● Wild cervid sampling outside the facility will be conducted in accordance with the guidelines and procedures described in the Detection in a free-ranging wild cervid within the borders of Tennessee section of this plan.

Detection in a free-ranging or captive cervid in an adjacent state, within 25 miles of the Tennessee border

● The TWRA will coordinate with the state wildlife agency in the adjoining state where CWD has been detected. TWRA staff will obtain information from that state’s CWD response program.
● If the index location is within 25 miles of the Tennessee border, a CWD Management Zone will be established within that portion of a 25-mile radius falling within Tennessee. Response procedures will be implemented using the protocol(s) outlined in the Detection in a free-ranging wild cervid within the borders of Tennessee section of this plan.

IV. COMMUNICATIONS STRATEGY

An effective CWD Communications Strategy, including a Public Information Plan, is an essential component of a successful CWD Response Plan. As indicated earlier, the communications goal of TWRA’s CWD Response Plan is to distribute accurate and effective information on CWD to the public, Agency staff, the Tennessee Fish and Wildlife Commission (TFWC) and other stakeholders. To be effective, communications must be embedded throughout the process of the Response Plan, including the Pre- and Post-detection phases. The following objectives, from the state of Montana’s CWD Management Plan, provide a good starting point for TWRA CWD Communications Strategy:
• Increase awareness of CWD and current CWD management strategies among targeted audiences.
• Provide clear understanding of surveillance program goals and accomplishments.
• Increase awareness and understanding of TWRA’s CWD Response Plan.
• Increase support for CWD Response Plan among targeted audiences.
• Generate support for response activities so response plan goals can be achieved.

Pre-Detection

The Association of Fish and Wildlife Agencies (AFWA) published its *Best Management Practices for Prevention, Surveillance, and Management of Chronic Wasting Disease* in 2018 (Gillin and Mawdsley 2018), which included a section on CWD online communications with the public. Their recommended Best Management Practices for CWD websites include (but not be limited to) the following information:

1. General information about CWD:
   a. History
   b. Species affected
   c. Pathogenesis
   d. Clinical signs
   e. Distribution across the state/province, country, world

2. Public health concerns:
   a. CDC recommendations
   b. Risk for livestock, domestic species

3. Recommendations for hunters:
   a. Hunt planning information (where applicable)
      i. Location (units, counties) of CWD sampling areas (mandatory, voluntary).
      ii. Check station locations, if applicable.
      iii. Options for submitting samples for CWD testing outside of sampling areas.
      iv. Relevant contact information, e.g. regional offices.
   b. Hunting in CWD-positive areas:
      i. Recognizing clinical signs
      ii. Personal Protective Equipment
   c. Post hunt processing:
      i. Field dressing
      ii. Deboning for transport
      iii. Preparing for taxidermy
      iv. Disposal of parts
   d. Movement of carcasses/parts/disposal recommendations
e. Reporting requirements
f. Use of natural deer urine products
g. Issues with feeding/baiting

4. Current CWD surveillance and response activities
   a. Background on how surveillance is being conducted
      i. Maps of CWD locations and prevalence
         1. Include species, hunt area/unit, county, or other relevant units
         2. Known data on infection rates and disease distribution.
      ii. Testing over time with positives/negatives
   b. Identify partners or locations where samples are collected (taxidermists, deer processors, drop-off or check stations)
   c. CWD management activities
   d. CWD research projects, if applicable

5. Public reporting of sick or diseased animals:
   a. Multiple methods for the public to report: Online forms, social media monitoring
   b. Provide relevant addresses and phone numbers
   c. Provide information urging people not to shoot sick animals or transport carcasses to reduce risks of contamination.
   d. Links to licensed wildlife rehabilitators

6. Reiterate relevant regulations, including:
   a. Carcass movement regulations
   b. Wildlife feeding/baiting
   c. Wildlife rehabilitation (fawn and elk/moose calf)
   d. Reporting requirements

7. CWD test result reporting
   a. Ability for partners and hunters to submit samples and check test results
      i. Must have unique identifier number that is meaningful to diagnostic laboratory or state/provincial agency
      ii. Ability to mark specific locations using standardized coordinate systems (e.g. UTM or latitude/longitude)

8. Educational materials
   a. Fact sheets
      i. Should be printable
      ii. Include information on transmission, species affected, distribution, etc.
      iii. Can be customized for specific groups (e.g., taxidermists, meat processors, wildlife rehabilitators, hunters, public)
   b. Frequently asked questions (FAQs)
   c. Other relevant websites
      i. CWD Alliance: http://cwd-info.org/
ii. Other states and provinces

**Post-Detection**

In the event that a CWD positive cervid is identified in Tennessee, the need for effective communications and a good Public Information Plan will be critical in handling anticipated media requests and information needs for the general public. It is likely that requests for accurate and up-to-date information from the news media, and from the general public will increase dramatically in the immediate aftermath of the detection of a CWD-positive cervid. At the same time, there will be a need for increased communications with TWRA personnel, (especially those involved in the CWD Response Team, Administrative Team, and Media Team), and key external stakeholders such as Dept. of Agriculture and USDA, among others. These needs will be handled through Internal and External communications channels.

**Internal**

Regular communications among TWRA staff and the TFWC is essential. Following a CWD detection, regular meetings (e.g., weekly or as needed) will be conducted where the CWD Field Response Team updates the CWD Administrative Team, which then updates the TFWC. Additionally, a representative of the CWD Administrative Team will update the TFWC during their regularly scheduled meetings and provide annual updates. Consideration should be given to developing standard reporting documents that provide updated information to Agency staff on a regular basis. The Louisiana Dept. of Wildlife and Fisheries developed a weekly Incident Action Plan and daily Situational Report documents to keep Agency staff and others informed on ongoing CWD activities.

**External**

As referenced earlier in this document, good and consistent external communications are also required. The TWRA CWD Media Team will be relied upon solely to communicate CWD matters to the public. Thus, all public and media inquiries to TWRA staff and the TFWC regarding CWD should be directed to TWRA’s Media Team. Staff and commissioners not on the Media Team should refrain from making public comment or commenting on social media about CWD in Tennessee, and instead should refer questions to the Media Team. In addition to the Media Team’s interactions with media, the Agency should consider regular updates on CWD response activities be posted on the Agency’s web site and through Agency social media platforms.

**V. Costs of Implementing this Plan**

The costs of implementing a CWD Response Plan can be substantial, both during the pre- and post-detection phases, but especially after a CWD-positive cervid has been detected. During the pre-detection phase, when the Agency has a goal of early detection of the disease, the majority of costs in implementing this plan include pre-detection sampling (according to the Risk
Assessment and Surveillance Strategy), procurement of supplies and equipment in preparation of sampling, developing communications materials for web and social media platforms, and other planning efforts.

During the post-detection (Containment goal) phase of a CWD response, the Agency can anticipate that costs, in terms of both financial outlays and personnel commitments, will increase substantially to meet the needs of implementing CWD management activities. These costs are primarily associated with the increased sampling in the CWD Management Zone. Other anticipated costs include testing diagnostics, employee travel expenses, sampling supplies and equipment, etc.

Additional to the financial costs of a post-detection response are the personnel deployments that are necessary to carry out the proposed activities in this plan. States such as Missouri and Arkansas, which have been in a post-detection CWD response for several years, have re-directed considerable personnel resources to CWD Response activities. These re-directions of staff time can obviously impact other fish and wildlife programs, and strain staff resources. Some of this can be counteracted through the hiring of hourly or seasonal staff, but agencies should prepare for significant outlays of staff time and resources during the early stages of a CWD response to a positive detection.
TWRA Chronic Wasting Disease Response Plan

LITERATURE CITED


Arkansas Game and Fish Commission. 2016. Chronic Wasting Disease Response Plan. Arkansas Game and Fish Commission, Little Rock, AR.


Risk-Based Surveillance for Chronic Wasting Disease in Tennessee
Executive Summary

Chronic wasting disease (CWD) is in the family of diseases known as transmissible spongiform encephalopathies (TSE). It is caused by a **prion** or infectious protein particle. In Tennessee, native white-tailed deer (*Odocoileus virginianus*) and reintroduced elk (*Cervus canadensis*), as well as several exotic captive species, are at risk for contracting CWD. CWD has not been detected in Tennessee as of 2018, although bordering states of Mississippi (2018), Arkansas (2015), Missouri (2010), and Virginia (2010) have all found CWD in wild white-tailed deer. In 2017, Tennessee Wildlife Resources Agency (TWRA) began a collaborative arrangement with the Cornell Wildlife Health Lab to assess risks of CWD introduction and spread within the state. The goal of this risk assessment and surveillance plan is to provide information to guide decisions regarding chronic wasting disease sampling in Tennessee. This report has the following information:

1) Provides an overview of the disease and its natural history

2) Identifies what is at stake for Tennessee should the disease be introduced

3) Evaluates the past surveillance effort in Tennessee

4) Assesses the risk of CWD introduction into the state and evaluates the potential consequences should the disease be introduced

5) Prescribes a risk-based weighted surveillance plan that takes into account TWRA biologists perceptions of risk factors, surrounding states’ surveillance, regulations, and CWD status; and provides a framework for future CWD sampling

CWD management is likely to be most effective when the disease has not spread widely within the wild populations. A surveillance program that focuses on the demographic classes and locations most likely to have the disease first gives managers the best opportunity to find disease at the earliest intrusion into the state. This plan provides a clear strategy for sampling goals for white-tailed deer by providing a weighted point value for which samples should be collected and proportioned by the highest-risk areas.
Workflow Diagram for Tennessee Wildlife Resources Agency’s Risk-based CWD Surveillance System
# Contents

Executive Summary .......................................................................................................................... 1
Goals .................................................................................................................................................. 4
CWD Background .......................................................................................................................... 5
CWD Impacts for Tennessee .......................................................................................................... 6
  Economic value of wild deer herd ............................................................................................ 7
Risk Assessment ............................................................................................................................. 7
  Outside Tennessee ..................................................................................................................... 7
  Inside Tennessee ......................................................................................................................... 9
Surveillance Plan ............................................................................................................................ 15
  Past surveillance efforts ............................................................................................................. 15
  Weighted Surveillance ............................................................................................................... 17
Establishing Point Quotas ............................................................................................................. 18
  TWRA Risk Evaluation ............................................................................................................ 19
  County Point Quotas ............................................................................................................... 19
  Implications and Recommendations for TWRA Biologists ...................................................... 19
  Region 1 ................................................................................................................................... 22
  Region 2 ................................................................................................................................... 23
  Region 3 ................................................................................................................................... 24
  Region 4 ................................................................................................................................... 25
Acknowledgments .......................................................................................................................... 26
References .......................................................................................................................................... 27
Glossary .............................................................................................................................................. 29
Goals

The goal of this risk assessment and surveillance plan is to provide information to guide decisions regarding CWD sampling in Tennessee. By finding CWD at the earliest intrusion into the state, the TWRA has the opportunity to mount a management response to eradicate the disease. Once CWD is established on the landscape, there is little chance of elimination and management strategies must change. Having a clear surveillance plan for which sex and age classes should be sampled and from where they should be collected helps based on a comprehensive risk assessment helps to focus sampling distribution on areas and classes of animals most likely to identify the disease first. At this time, Tennessee is not known to have CWD; however, previous surveillance efforts have focused primarily on samples of convenience rather than on risk factors.

A risk assessment was developed to determine the factual basis of threats associated with chronic wasting disease introduction to Tennessee through a systematic evaluation of potential hazards (activities or situations that could introduce or distribute CWD), including activities conducted by taxidermists, meat processors, captive cervid owners, and neighboring states. To maximize the likelihood that sampling will detect CWD-positive deer, the surveillance strategy provided will emphasize locations and age classes of deer that are of the greatest risk for CWD infection using weighted surveillance (Walsh et al. 2011, Heisey et al. 2014) and a qualitative risk assessment process to identify areas of concern.
CWD Background

Chronic wasting disease is in the family of diseases known as transmissible spongiform encephalopathies (TSE). It is caused by a prion or infectious protein particle. Other TSEs include scrapie in sheep, bovine spongiform encephalopathy or “mad cow” disease, and Creutzfeldt-Jakob syndrome in humans. CWD is the only known TSE of free-ranging species. CWD was first identified in a wildlife research facility at Colorado State University in 1967 and has subsequently spread to 25 states and three Canadian provinces in both free-ranging and captive cervids (Figure 1). Some of the more recent detections have come from the southeast region with wild white-tailed deer in Mississippi in 2018; wild elk and white-tailed deer in Arkansas in 2015; captive white-tailed deer in Missouri in 2010 and wild white-tailed deer in 2012; wild white-tailed deer in Virginia in 2010; and wild white-tailed deer in West Virginia in 2005.

White-tailed deer, mule/black-tailed deer (O. hemionus), elk, red deer (C. elaphus), moose (Alces alces) and reindeer/caribou (Rangifer tarandus) are the North American species that are naturally susceptible to CWD. Population-level impacts have been demonstrated in white-tailed deer, mule deer, and elk. In a Wyoming white-tailed deer study, Edmunds et al. (2016) estimated 42% prevalence in females and 28% prevalence in males. In this population, CWD-positive deer were 4.5 times more likely to die annually, and these deer also were overrepresented in the hunter harvest. This population was declining at 10% annually. Estimates indicate that population declines are likely to begin once the prevalence rate reaches 27%. A similar study of Wyoming mule deer showed that males had higher prevalence rates (50%) than females (30%), which is typical of most CWD-endemic areas (DeVivo et al. 2017). This population is declining at 19% annually. Elk disease dynamics appear to be slower than those of white-tailed and mule deer. Monello et al. (2014) found an 8% prevalence in elk with a stable population, but it was expected to decline if prevalence exceeded 13%.

Animals acquire infection through direct contact with other infected animals or indirectly with prions that have contaminated the environment (Almberg et al. 2011). Animals may begin to shed prions in fluids as soon as three months after becoming infected (Plummer et al. 2017). Prions have been detected in urine, feces, and saliva. Once in the environment, prions are able to bind to the soil and increase infectivity (Johnson et al. 2006). Limited studies have shown prion persistence in the soil for up to 16 years (Georgsson et al. 2006). Prions can also be taken up into plant tissues where they remain infectious (Pritzkow et al. 2015). There is currently no known method for decontamination or animal treatment. CWD is always fatal. There has not been any demonstrated genetic resistance to disease; rather there have been animals who have showed extended infection times. Similarly, vaccination trials have been largely unsuccessful.

Humans are not known to be susceptible to CWD. However, the similarity between CWD and other transmissible spongiform encephalopathies (e.g., “mad cow” disease) that have infected humans demands a level of caution. Recent unpublished animal studies suggest CWD can infect non-human primates from consumption of meat from CWD-infected animals. Therefore, the Centers for Disease Control and Prevention (CDC) recommends that no one consume a known CWD-positive animal.
Figure 1. Current known distribution of CWD in North America.

CWD Impacts for Tennessee

Management for wildlife health contributes in at least two ways to wildlife resource management as a public trust activity. First, it preserves the quality and quantity of trust assets (wildlife resources) for future generations. Secondly, to deliver benefits from trust management, agencies must include reduction of negative impacts associated with wildlife, whether these are perceived or real risks (Decker et al. 2016).

Chronic wasting disease has the potential to diminish the quality of the trust assets because diseased animals are not as valuable as a trust resource. Hunters and the public are told not to consume sick animals, and decreased hunter participation has been documented in endemic areas. Hunters in several states indicated that they would not be as likely to participate in recreational activities if CWD had been found in the local deer herd (Needham et al. 2006).

A CWD outbreak would also put a severe financial strain on government agencies, not only from the lost revenue from license sales and associated federal funding, but also by redirecting financial and personnel resources (Bishop 2004). State agencies may face opposition to disease management activities, which then hinders their abilities to operate effectively as trust managers (Needham and
Vaske 2008). Mistrust of the agency and lack of cooperation from the public can bleed into other initiatives and activities. Hunting, as a tool for managing deer populations, could also be impacted, and revenue from license sales could be significantly diminished. Chronic wasting disease activities should be considered not only from a biological perspective, but also the social, economic, and ecological impacts.

Economic value of wild deer herd
Wildlife resources are often difficult to commodify. Expenditures by hunters include direct revenue gained from license sales and indirect economic input from retail sales, salaries and wages, and taxes. In Tennessee, there were an estimated 360,143 deer hunters afield in 2012. White-tailed deer hunting is the most popular type of hunting in Tennessee, which represented 87.1% of all hunters (Schexnader et al. 2012). The TWRA appears to have a good relationship with hunters, as 77.7% of hunters expressed satisfaction with TWRA management of deer hunting in Tennessee. Similarly, hunters value the resource, as 53.9% of hunters also felt that the Tennessee deer herd was in better than average or excellent condition. Most (80.2%) hunters purchased a big game license (sportsman, basic, or lifetime) to hunt in 2012. Despite positive reviews of hunting opportunities, declining numbers of hunters nationally and reduced sportsman license sales in Tennessee (unpublished data) indicate that the TWRA should focus on cost-effective disease prevention measures where possible to maintain support for hunting opportunities. Menard et al. (2003) estimated a 15% decline in deer hunting-related expenditures following discovery of CWD in the state, resulting in a $43.6M in economic revenue loss. Additional benefits from table fare and recreation represent tangible commodities for the hunting public. For instance, 3,961,573 deer hunt days (based on 11 mean number of days hunted for 360,143 hunters) at $40/day recreational value (Bishop 2004) equals $158.5M/year in recreational value. These commodities are also likely to be impacted with detection of CWD.

Risk Assessment
Outside Tennessee
Recent discoveries of CWD in Missouri, Arkansas, and Mississippi have raised the risk for CWD introduction into Tennessee. Texas, Maryland, Virginia, and West Virginia also present risks with longer time frame since endemic status, but further geographic distance. We surveyed 16 southeast states of which seven are CWD-positive, and nine have not detected CWD at this time (Table 1). There were nine states that sample more than 1,000 wild cervids annually, six states with less than 100 captive cervid facilities, and 12 states with authorized high-fence shooting operations. Only two states allow import of all captive live cervids, Kentucky allows import only from Indiana (no known CWD), and three other states allow import of exotic or non-native species. While most of the current CWD-positive states have increased disease sampling, many current states that have not detected CWD typically have minimal sampling with the exception of Tennessee and Kentucky. Sampling of clinical suspect animals in most states is very beneficial, but the number of sampling opportunities is low compared to that provided by hunter harvested and roadkill animals. While we recognize the coarse scale of these metrics, they are often helpful for directing surveillance efforts in the absence of other information. Illegal activities, such as unapproved movement or release of live cervids (Tidd 2018), has occurred from CWD-positive herds (Fitzgerald 2017), but was not assessed by this process. Also, captive cervid regulations vary by state, including allowing shooting operations (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, Missouri, South Carolina, Tennessee, Texas, West Virginia) and permitted release of captive-raised cervids (Texas). While not a comprehensive list of risk, we used parameters for number of wild
cervids sampled, number of captive cervid facilities, and number of shooting operations to assess risk from neighboring states. This is certainly not a comment on other states’ practices or situations, but rather a suggestion for TWRA on where to focus surveillance efforts.

Table 1. Risk factors of neighboring states. These include proximity to Tennessee, if CWD had previously been detected in that state, if surveillance in wild white-tailed deer exceeds 1000 animals tested annually, if feeding or baiting is permitted anywhere in the state, if whole carcasses are permitted to be imported from non-CWD-positive states, if there are more than 100 captive cervid facilities in the state, and if the state allows import of live captive cervids. [Yes = 1, No = 0].

<table>
<thead>
<tr>
<th>State</th>
<th>Borders TN</th>
<th>CWD-positive (wild or captives)</th>
<th>Wild surveillance &lt;1000</th>
<th>Feeding/Baiting permitted anywhere</th>
<th>Whole carcasses from all or CWD-states</th>
<th>Captive cervid facilities &gt;100</th>
<th>Live cervid import</th>
<th>Risk points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Arkansas</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Delaware</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Florida</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Georgia</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Kentucky</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Louisiana</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Maryland</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Mississippi</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Missouri</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>N. Carolina</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>S. Carolina</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Tennessee</td>
<td>n/a</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Texas</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Virginia</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>W. Virginia</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

Given the many states bordering Tennessee and the variability in regulations, sampling efforts, and captive cervid facilities, there is not one particular geographic area that represents a highest risk. The states currently known to be CWD-positive are an obvious hazard along the Tennessee border from natural deer movement. However, CWD management areas in Virginia, West Virginia, and Maryland are not geographically close. Introduction of CWD from natural cervid movement is most likely to occur along Tennessee’s western border from Missouri, Arkansas, or Mississippi.

Human-assisted movement of prions via carcasses or trophy heads represents a high risk for CWD introduction if CWD-positive parts are discarded on the landscape. This factor is more difficult to assess geographically. We used survey data from taxidermists and processors to gauge hazards from imported carcasses and parts, but this information does not include individual hunters who may process their animals at home. Tennessee just approved a whole carcass ban from all states because of the risk of CWD-positive parts being discarded in Tennessee prior to CWD detection in the state of origin. Some
states in the southeast have very limited surveillance sampling and may not detect CWD in a timely manner. A secondary consideration is that feeding and baiting are frequently permitted in this region. Concentrating animals around a food source is known to enhance disease transmission, and therefore, may facilitate transmission of CWD prior to detection by limited surveillance.

Inside Tennessee

To assess risks of CWD introduction and spread within the state, we surveyed taxidermists, processors (Figures 2 and 3), and selected captive cervid operations (preserves and high fence, Figure 4). Surveys were conducted by TWRA biological and law enforcement staff between October 2017 and January 2018 using a list of all taxidermists permitted by TWRA and all processors permitted by Tennessee Department of Agriculture (TDA). Of the 484 businesses identified (Table 2), 93 were known by TWRA staff to be closed or could not be contacted and assumed closed. In total, 237 taxidermists, 122 meat processors, and 6 taxidermists/processors were successfully contacted for interviews, of which 16 indicated that they did not handle deer, and 1 handled only deer antlers and capes. Six of the taxidermists interviewed indicated that they would be ending their business prior to the next season. Reasons given included moving out of state and retirement.

TWRA staff were diligent in completing surveys with a high completion rate (88-100%, Table 2).
Table 2. Response by business type to determine CWD-associated risks with activities. Licensed taxidermists and meat processors were contacted. They were not included in the risk assessment if they were no longer in business or did not handle white-tailed deer.

<table>
<thead>
<tr>
<th>Business Type</th>
<th>Not in business</th>
<th>Not contacted</th>
<th>No deer</th>
<th>Survey completed</th>
<th>Total businesses</th>
<th>Survey completion rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxidermist</td>
<td>17</td>
<td>10</td>
<td>10</td>
<td>227</td>
<td>264</td>
<td>96%</td>
</tr>
<tr>
<td>Processor</td>
<td>76</td>
<td>16</td>
<td>6</td>
<td>116</td>
<td>214</td>
<td>88%</td>
</tr>
<tr>
<td>Taxidermist/Processor</td>
<td>6</td>
<td>6</td>
<td></td>
<td>6</td>
<td>6</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>93</td>
<td>26</td>
<td>16</td>
<td>349</td>
<td>484</td>
<td>93%</td>
</tr>
</tbody>
</table>

The number of taxidermists and processors varied across the regions with the highest densities in Region I, II, IV, and III, respectively (Table 3). Very few of these businesses also had live captive cervids on the premises, which was good news as CWD detections in New York and Minnesota involved business proprietors mixing taxidermy and live cervids. However, 74% of taxidermists and 83% of processors received deer carcasses or parts from outside of Tennessee (Table 4). This information was collected when whole carcasses were not permitted for import from CWD-positive states; however, given recent detections in Arkansas and Mississippi, CWD-infected animals could have been imported to Tennessee prior to detection. Distribution of deer parts on the landscape is a potential route of CWD introduction. From the risk assessment, it appears that 37% of taxidermists and 22% of processors use methods that could leave prions on the landscape, such as open pits, compost, discarded on the ground, or fed to animals (Table 5).

Table 3. Distribution of taxidermists and processors across TWRA regions.

<table>
<thead>
<tr>
<th>REGIONS</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>ALL TN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counties</td>
<td>25</td>
<td>25</td>
<td>23</td>
<td>22</td>
<td>95</td>
</tr>
<tr>
<td>Square miles</td>
<td>8,834</td>
<td>8,992</td>
<td>11,730</td>
<td>12,587</td>
<td>42,143</td>
</tr>
<tr>
<td>Taxidermist</td>
<td>66</td>
<td>65</td>
<td>47</td>
<td>69</td>
<td>247</td>
</tr>
<tr>
<td>Processor</td>
<td>49</td>
<td>40</td>
<td>24</td>
<td>25</td>
<td>138</td>
</tr>
<tr>
<td>Both</td>
<td>1</td>
<td>5</td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>116</td>
<td>105</td>
<td>76</td>
<td>94</td>
<td>391</td>
</tr>
</tbody>
</table>
Table 4. Number of taxidermists and processors by region who have live captive cervids on their premises and/or who handle deer carcasses harvested from outside Tennessee.

<table>
<thead>
<tr>
<th>Business type</th>
<th>Live captive cervids</th>
<th>Deer from out-of-state</th>
<th>Interviewed</th>
<th>Open businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Taxidermists</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>1</td>
<td>44</td>
<td>61</td>
<td>66</td>
</tr>
<tr>
<td>II</td>
<td>0</td>
<td>46</td>
<td>62</td>
<td>65</td>
</tr>
<tr>
<td>III</td>
<td>0</td>
<td>32</td>
<td>40</td>
<td>47</td>
</tr>
<tr>
<td>IV</td>
<td>0</td>
<td>49</td>
<td>64</td>
<td>69</td>
</tr>
<tr>
<td>All Taxidermists</td>
<td>1</td>
<td>171</td>
<td>227</td>
<td>247</td>
</tr>
<tr>
<td><strong>Processors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>0</td>
<td>29</td>
<td>38</td>
<td>49</td>
</tr>
<tr>
<td>II</td>
<td>0</td>
<td>26</td>
<td>34</td>
<td>40</td>
</tr>
<tr>
<td>III</td>
<td>0</td>
<td>21</td>
<td>23</td>
<td>24</td>
</tr>
<tr>
<td>IV</td>
<td>1</td>
<td>20</td>
<td>21</td>
<td>25</td>
</tr>
<tr>
<td>All Processors</td>
<td>1</td>
<td>96</td>
<td>116</td>
<td>138</td>
</tr>
<tr>
<td><strong>Taxidermist/Processors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>II</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Taxidermist/Processors</td>
<td>1</td>
<td>5</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><strong>State Total</strong></td>
<td>3</td>
<td>272</td>
<td>349</td>
<td>391</td>
</tr>
</tbody>
</table>
Figure 3. Disposal methods and activities used by businesses that could allow wild or captive cervids to interact with CWD prions. Using a pit (A), composting (B), or otherwise disposing of carcasses...
on the landscape (C) is a risk. Several businesses had unknown disposal methods (D) or also had live captive cervids on the property (E).
We also evaluated captive cervid facilities in the state (Figure 4). Of the 88 known licensed facilities, we only collected data on 21, which were classified as preserves or known to have elk and/or other relevant non-native species, such as reindeer. About 75% of these facilities have elk, red deer, or mule deer that are known to be naturally susceptible to CWD. Two facilities also have reindeer, which have just recently been shown to be naturally susceptible (Benestad et al. 2016), but are not being included in the USDA CWD Herd Certification Program Standards at this time. While numbers were not available to adequately assess most of these facilities, it appears that they are generally in compliance with regulations with adequate fencing. There are few captive operations that also have meat processing (4) or taxidermy businesses (1) identified as well, and these may represent a higher risk because of the possible transfer of prions between wild carcasses brought in and live cervids. High fence facilities are not regulated by TWRA or TDA, and therefore were not assessed for risk through personal interviews. However, high fence facilities were included in calculations of county point totals because of the potential for illegal activity that might increase risk of CWD introduction to the state.
Figure 4. Captive cervid facilities (high fence, non-native/elk, and preserve) in Tennessee.

Surveillance Plan

Past surveillance efforts
Tennessee has been conducting routine CWD surveillance since 2002 and produced over 13,000 non-detected samples. These efforts are typically directed at hunter-harvested white-tailed deer, although most harvested wild elk are also tested (Table 6). Surveillance efforts have intensified in the last few years; however, most white-tailed deer samples are collected by convenience sampling rather than by risk (Figures 4 and 5). Weakley and Roane counties have provided a significant proportion of the total samples in the past two years and are likely over-represented in the sampling. In 2015, a pilot program was initiated to include samples collected by taxidermists to increase testing of adult (2.5 years or older) adult males. This program will be continued during this surveillance plan.
Table 6. Previous CWD surveillance by species: elk, red deer, white-tailed deer (WTD) and no data provided (N/A) in Tennessee.

<table>
<thead>
<tr>
<th>Season</th>
<th>Elk</th>
<th>Red Deer</th>
<th>WTD</th>
<th>N/A</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-2003</td>
<td>22</td>
<td></td>
<td>1,842</td>
<td></td>
<td>1,864</td>
</tr>
<tr>
<td>2003-2004</td>
<td>8</td>
<td></td>
<td>4,112</td>
<td></td>
<td>4,120</td>
</tr>
<tr>
<td>2004-2005</td>
<td>3</td>
<td></td>
<td>60</td>
<td>673</td>
<td>736</td>
</tr>
<tr>
<td>2005-2006</td>
<td></td>
<td></td>
<td>225</td>
<td>341</td>
<td>566</td>
</tr>
<tr>
<td>2006-2007</td>
<td>5</td>
<td></td>
<td>253</td>
<td></td>
<td>258</td>
</tr>
<tr>
<td>2007-2008</td>
<td></td>
<td></td>
<td></td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>2008-2009</td>
<td>13</td>
<td>2</td>
<td>363</td>
<td></td>
<td>378</td>
</tr>
<tr>
<td>2009-2010</td>
<td>11</td>
<td>9</td>
<td>194</td>
<td></td>
<td>214</td>
</tr>
<tr>
<td>2010-2011</td>
<td>19</td>
<td>2</td>
<td>38</td>
<td>160</td>
<td>219</td>
</tr>
<tr>
<td>2011-2012</td>
<td>6</td>
<td></td>
<td>316</td>
<td></td>
<td>322</td>
</tr>
<tr>
<td>2012-2013</td>
<td>5</td>
<td>4</td>
<td>319</td>
<td></td>
<td>328</td>
</tr>
<tr>
<td>2013-2014</td>
<td>5</td>
<td>2</td>
<td>279</td>
<td></td>
<td>286</td>
</tr>
<tr>
<td>2014-2015</td>
<td>8</td>
<td></td>
<td>361</td>
<td></td>
<td>373</td>
</tr>
<tr>
<td>2015-2016</td>
<td>4</td>
<td></td>
<td>288</td>
<td></td>
<td>292</td>
</tr>
<tr>
<td>2016-2017</td>
<td>10</td>
<td></td>
<td>2,004</td>
<td></td>
<td>2,014</td>
</tr>
<tr>
<td>2017-2018</td>
<td>1</td>
<td></td>
<td>1,852</td>
<td>59</td>
<td>1,911</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>109</td>
<td>23</td>
<td>12,282</td>
<td>1,427</td>
<td>13,905</td>
</tr>
</tbody>
</table>

Figure 5. 2017-2018 White-tailed Deer CWD Sampling by County

Figure 6. 2016-2017 White-tailed Deer Sampling by County
Table 7. Comparison of surveillance from deer sex and age weighted point values for sampling seasons 2017-2018 and 2016-2017.

<table>
<thead>
<tr>
<th></th>
<th>2017-2018</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Unknown</td>
<td>Total</td>
<td>Male</td>
<td>Female</td>
<td>Unknown</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>Deer</td>
<td>Points</td>
<td>Deer</td>
<td>Points</td>
<td>Deer</td>
<td>Points</td>
<td>Deer</td>
<td>Points</td>
</tr>
<tr>
<td>Adult</td>
<td>615</td>
<td>1,845</td>
<td>345</td>
<td>517.5</td>
<td>0</td>
<td>0</td>
<td>960</td>
<td>2,362.5</td>
</tr>
<tr>
<td>Yearling</td>
<td>559</td>
<td>559</td>
<td>164</td>
<td>164</td>
<td>1</td>
<td>0</td>
<td>724</td>
<td>724</td>
</tr>
<tr>
<td>Fawn</td>
<td>22</td>
<td>0</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>38</td>
<td>0</td>
</tr>
<tr>
<td>Unknown</td>
<td>80</td>
<td>0</td>
<td>46</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>130</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>1,276</td>
<td>2,404</td>
<td>571</td>
<td>681.5</td>
<td>5</td>
<td>0</td>
<td>1,852</td>
<td>3,086.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2016-2017</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Unknown</td>
<td>Total</td>
<td>Male</td>
<td>Female</td>
<td>Unknown</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>Deer</td>
<td>Points</td>
<td>Deer</td>
<td>Points</td>
<td>Deer</td>
<td>Points</td>
<td>Deer</td>
<td>Points</td>
</tr>
<tr>
<td>Adult</td>
<td>656</td>
<td>1,968</td>
<td>474</td>
<td>714</td>
<td>1</td>
<td>1</td>
<td>1,132</td>
<td>2,680</td>
</tr>
<tr>
<td>Yearling</td>
<td>469</td>
<td>469</td>
<td>157</td>
<td>157</td>
<td>0</td>
<td>0</td>
<td>626</td>
<td>626</td>
</tr>
<tr>
<td>Fawn</td>
<td>2</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Unknown</td>
<td>143</td>
<td>0</td>
<td>50</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>199</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>1,276</td>
<td>2,437</td>
<td>690</td>
<td>868</td>
<td>3</td>
<td>1</td>
<td>2,005</td>
<td>3,306</td>
</tr>
</tbody>
</table>

Weighted Surveillance

By using weights or “points” assigned to an animal based on its value for detecting disease, we improve the information gathered per sample over a randomized collection process (Heisey et al. 2014, Jennelle et al. 2018). This system improves the statistical assurance of freedom from disease with fewer tests. For this plan, we will be using surveillance weights developed for Wisconsin wild white-tailed deer (Jennelle et al. 2018); however, TWRA may choose to further develop their own surveillance weights at a later date. For the ease of tracking quotas, we will use a point value based on sex and age that are close approximations of the modeled weights provided. For 95% confidence level (1-alpha) that TWRA will be able to detect one case of CWD if the prevalence in yearling males (reference class for comparison) is 0.1% (0.001), we will need to collect 2,973 points (https://popr.cfc.umt.edu/CWD/). Based on 2017-2018 sampling efforts (2,993 points), we can conclude with 95% probability that prevalence in Tennessee white-tailed deer was between 0% and 0.1%. In other words, by collecting 2,993 yearlings males, 924 adult bucks, or 2,302 adult does (presumably it will be a combination of these), you are 95% certain that if CWD exists on the landscape, it is at a prevalence less than 0.1% (Table 8). Research in CWD-positive states has identified older males as being more likely to have CWD than females or younger males. Males are considered a better surveillance sample in most systems because of their large home ranges, co-mingling with other males during the non-breeding season, close contact with females during the rut, geophagy (dirt-eating), and other behaviors. The weighted point system that places higher values on older animals because they have a higher likelihood of testing positive for CWD. This method improves surveillance efficiency by testing fewer, high quality animals. These point values to be used to track quotas are a close approximation of surveillance weights, but in more tangible numbers. For example, a buck that is 2.5 years or older at time of harvest is worth 3 points while a yearling buck is worth 1 point; thus, an adult buck is three times more valuable a sample as a yearling buck. A doe that is 2.5 years or older at time of harvest is worth 1.5 points while a yearling
doe is only 1 point. The objective is to actively seek older bucks and does for sampling to increase the probability of early disease detection. Fawns are excluded from the point tally because of the low probability of disease detection in this age class. Unknown sex and age samples are not counted toward point quotas as their value cannot be accurately assessed. While there is a slight difference in the surveillance weight and point value, the overall effect in a statewide surveillance program is minimal. For simplicity, we will deviate from Jennelle et al. (2018) by applying these point values regardless of how the sample is collected (hunter harvest, vehicle collision, found dead, sharpshooting, or reported abnormal). There is evidence from eastern states (e.g., Pennsylvania, Virginia, and West Virginia) that vehicle collisions are a more valuable surveillance sample than Wisconsin data may indicate. However, there are no weighted values available at this time for eastern states’ data so we will provide equivalent weights across sample collection method.

Table 8. Modeled weights for sex and age classes of hunter-harvested animals. Surveillance point values are simplified weights to meet county point quotas and may come from any source (hunter harvest, vehicle collision, found dead, or reported abnormal).

<table>
<thead>
<tr>
<th>Sample</th>
<th>Hunter-harvested deer’s weighted value</th>
<th>Surveillance point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult Males (≥2.5 yrs)</td>
<td>3.237</td>
<td>3</td>
</tr>
<tr>
<td>Adult Females (≥2.5 yrs)</td>
<td>1.328</td>
<td>1.5</td>
</tr>
<tr>
<td>Juvenile Males (&lt;2.5 yrs)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Juvenile Females (&lt;2.5 yrs)</td>
<td>0.877</td>
<td>1</td>
</tr>
</tbody>
</table>

Establishing Point Quotas

Based on surveillance collection efforts by TWRA biologists for the past two years, sex and age demographics demonstrate that an average of 3,000 points annually is feasible (Table 7). The total statewide goal can be reached considering demographic points, but it does not dictate where the highest risks for CWD introduction occur on the landscape. Areas with higher risk of disease introduction should have more intensive surveillance. However, if the deer population or deer harvest is sufficiently low in these areas to prevent adequate sampling, the effort required to acquire desired samples may be logistically infeasible. Therefore, the 3000 point statewide quota is divided into two categories: hazards (2000 points) and deer harvest density (1000 points, Figure 7). These points will be distributed per county. Each county will have a point quota assigned based on the risk points assigned by hazard for specific locations and estimated deer density. Counties along the border will be assigned additional points (+15) if they border a CWD-positive state or if a neighboring state has practices that may represent a higher risk for CWD introduction with minimal disease surveillance. There are 15 counties that border CWD-positive states of Missouri, Arkansas, Mississippi, and Virginia.
TWRA Risk Evaluation

To utilize knowledge of TWRA biologists, we provided a comprehensive list of potential hazards. These hazards were characterized as negligible (0), low (1), medium (2), or high (3) by TWRA biologists in an online survey administered through Qualtrics survey software. The average of these hazards was then used to assign risk points for each location that identified these hazards during the field risk assessment (Table 9). Each location of a taxidermist, meat processor, preserve, or high fence facility that was recorded as being in operation was assigned +1 as a base point to mark its location, then additional risk points were added on to that location. All locations were totaled per county and apportioned based on 2000 risk points.

County Point Quotas

Sampling point quotas are provided by region and county. These quotas are suggested efforts based on the accumulation of hazards and deer population density; however, staffing considerations and ability to obtain samples may impact reaching these quotas each year. We suggest that point quotas are recalculated with updated information every five years. A CWD surveillance database will be provided to track progress toward reaching county quotas as test results are received. Field staff should receive regular updates on status of county quotas to ensure they can meet goals during the hunting season. These quotas can be filled by any source of wild white-tailed deer from hunter harvest, clinically ill, vehicle collisions, sharpshooting, and found dead. The point quotas do not factor in hunter-harvested elk, clinically ill elk, or escaped captive cervids. However, these animals should be collected and tested in every instance possible.

Implications and Recommendations for TWRA Biologists

Because this CWD surveillance strategy is more targeted and spatially explicit, it is important to note the implications and considerations for TWRA biologists as they implement this strategy in their respective regions.

Age-sex sampling

This weighted surveillance strategy does not replace the long-standing monitoring protocol in place for monitoring the age and sex of the harvest, hereafter referred to as age-sex sampling. Age-sex sampling requires staff to sample data from all deer that enter the check station/processor as a quasi-random sample of the harvest occurring on the landscape. This means that not all of the deer checked for age-sex sampling will require a CWD sample. For instance, if a biologist or technician checks a deer from a
county where the CWD point quota has already been achieved or if it is a fawn (worth 0 points), the biologist would still collect all biological data necessary for age-sex sampling but not collect a CWD sample.

**Taxidermist/processor program**

To assist with efforts to increase the volume of CWD samples in the two previous seasons (i.e., 2016-17 and 2017-18), TWRA piloted a program to incentivize partnerships from taxidermists and processors. We recommend leveraging this program early and often, especially in counties that have historically not generated many samples and now have a substantial point quota. We also recommend regular communication with participating taxidermists and/or processors to ensure they are not collecting samples from counties where the quota has already been achieved.

Samples from taxidermists are another example of data that should not be included in age-sex sampling. Most samples collected from participating processors would also be ineligible for age-sex sampling unless the processor had set aside all deer heads that came into their business during a given time period. Otherwise, these samples would be biased and therefore inappropriate for use in age-sex sampling. Biologists will need to use discretion as to when data should be used for only one or both of these sampling efforts (i.e., CWD surveillance and age-sex estimation).

**Other considerations**

Even with the taxidermist and processor program, achieving county point quotas may seem daunting so here we provide a few more considerations:

- Roadkills and clinicals count towards point quotas
- Central office WD staff, including Wildlife Veterinarian, are available and willing to help
- Check stations on large WMAs
- Wildlife Officers may be willing to help
- Long seasons with frequent status updates will enable staff to adjust accordingly

---

1 TWRA pays participating taxidermists $15 for each pair lymph nodes that is properly preserved, packaged, and labeled
2 TWRA pays participating processors $5/adult deer head with valid confirmation number attached
3 Responding to reported cases of clinical deer is still encouraged even after county point quotas are achieved
Table 9. Risk points average and variance for assessment of hazards by TWRA biologists

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Risk Points Average</th>
<th>Variance</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low fence quality- not maintained to an acceptable standard</td>
<td>3.00</td>
<td>0.00</td>
<td>Captive</td>
</tr>
<tr>
<td>Importation of live captive cervids (e.g., elk, red deer, sika, moose, reindeer/caribou) from out-of-state</td>
<td>2.91</td>
<td>0.09</td>
<td>Captive</td>
</tr>
<tr>
<td>Owner is not in compliance with regulations</td>
<td>2.91</td>
<td>0.09</td>
<td>Captive</td>
</tr>
<tr>
<td>Disposal method for cervid parts are accessible by wild deer, elk, or scavengers (i.e., left out on the landscape, in an open pit, or otherwise not buried or contained)</td>
<td>2.82</td>
<td>0.16</td>
<td>Taxi/Processor</td>
</tr>
<tr>
<td>Disposal method of carcasses/parts that is available to wild deer or elk</td>
<td>2.73</td>
<td>0.42</td>
<td>Captive</td>
</tr>
<tr>
<td>Hunter-harvested cervid parts coming in from out-of-state</td>
<td>2.55</td>
<td>0.47</td>
<td>Taxi/Processor</td>
</tr>
<tr>
<td>High fence shooting operation</td>
<td>2.55</td>
<td>0.27</td>
<td>Captive</td>
</tr>
<tr>
<td>Medium - Mostly 8’ and questionable escapability</td>
<td>2.55</td>
<td>0.27</td>
<td>Captive</td>
</tr>
<tr>
<td>Live captive cervids present on property</td>
<td>2.36</td>
<td>0.85</td>
<td>Taxi/Processor</td>
</tr>
<tr>
<td>Possession of CWD-susceptible species</td>
<td>2.36</td>
<td>0.45</td>
<td>Captive</td>
</tr>
<tr>
<td>&gt;100 number of animals handled annually by a deer processor or taxidermist</td>
<td>2.18</td>
<td>0.76</td>
<td>Taxi/Processor</td>
</tr>
<tr>
<td>High fence quality - 8’ and no breaches</td>
<td>2.09</td>
<td>0.49</td>
<td>Captive</td>
</tr>
<tr>
<td>Additional activities: Wild deer rehabilitator</td>
<td>2.00</td>
<td>1.11</td>
<td>Captive</td>
</tr>
<tr>
<td>Additional activities: Deer Processor</td>
<td>1.91</td>
<td>0.49</td>
<td>Captive</td>
</tr>
<tr>
<td>Additional activities: Taxidermist</td>
<td>1.82</td>
<td>0.36</td>
<td>Captive</td>
</tr>
<tr>
<td>Also is a wild deer rehabilitator</td>
<td>1.73</td>
<td>1.22</td>
<td>Taxi/Processor</td>
</tr>
<tr>
<td>10-100 deer handled annually by a deer processor or taxidermist</td>
<td>1.70</td>
<td>0.68</td>
<td>Taxi/Processor</td>
</tr>
<tr>
<td>0-10 deer handled annually by a deer processor or taxidermist</td>
<td>1.27</td>
<td>1.22</td>
<td>Taxi/Processor</td>
</tr>
</tbody>
</table>
Table 10. County CWD surveillance sampling quotas by region. Sample points are aggregated from two sources: estimated deer density (1000 points statewide) and identified hazards (2000 points statewide). Cumulative proportional sample points are then tallied for each county to define a county sampling quota.

<table>
<thead>
<tr>
<th>REGION 1</th>
<th>Deer Population</th>
<th>Hazards</th>
<th>Sample Points Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deer Density (/mi²)</td>
<td>Sample Points</td>
<td>Processes &amp; Taxidermists</td>
</tr>
<tr>
<td>Benton</td>
<td>3.63</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Carroll</td>
<td>4.88</td>
<td>22</td>
<td>5</td>
</tr>
<tr>
<td>Chester</td>
<td>3.19</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Crockett</td>
<td>1.94</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Decatur</td>
<td>3.46</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Dyer</td>
<td>1.11</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Fayette</td>
<td>5.53</td>
<td>29</td>
<td>10</td>
</tr>
<tr>
<td>Gibson</td>
<td>2.56</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>Hardeman</td>
<td>5.26</td>
<td>26</td>
<td>8</td>
</tr>
<tr>
<td>Hardin</td>
<td>3.92</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>Haywood</td>
<td>3.33</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>Henderson</td>
<td>3.11</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Henry</td>
<td>6.12</td>
<td>27</td>
<td>13</td>
</tr>
<tr>
<td>Houston</td>
<td>6.50</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Humphreys</td>
<td>3.94</td>
<td>16</td>
<td>3</td>
</tr>
<tr>
<td>Lake</td>
<td>0.64</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Lauderdale</td>
<td>1.78</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Madison</td>
<td>4.57</td>
<td>19</td>
<td>7</td>
</tr>
<tr>
<td>McNairy</td>
<td>3.82</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>Obion</td>
<td>2.39</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Perry</td>
<td>4.53</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>Shelby</td>
<td>1.67</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Stewart</td>
<td>4.23</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>Tipton</td>
<td>2.66</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Weakley</td>
<td>4.27</td>
<td>18</td>
<td>4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>338</td>
<td>147</td>
<td>19</td>
</tr>
<tr>
<td>REGION 2</td>
<td>Deer Population</td>
<td>Hazards</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>-----------------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deer Density (/mi²)</td>
<td>Sample Points</td>
<td>Processors &amp; Taxidermists</td>
</tr>
<tr>
<td>Bedford</td>
<td>3.30</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>Cannon</td>
<td>3.58</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Cheatham</td>
<td>3.79</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Coffee</td>
<td>3.04</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Davidson</td>
<td>2.27</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Dickson</td>
<td>4.89</td>
<td>18</td>
<td>6</td>
</tr>
<tr>
<td>Franklin</td>
<td>4.45</td>
<td>19</td>
<td>13</td>
</tr>
<tr>
<td>Giles</td>
<td>6.00</td>
<td>27</td>
<td>6</td>
</tr>
<tr>
<td>Hickman</td>
<td>4.31</td>
<td>19</td>
<td>5</td>
</tr>
<tr>
<td>Lawrence</td>
<td>4.37</td>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td>Lewis</td>
<td>2.94</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Lincoln</td>
<td>5.16</td>
<td>22</td>
<td>10</td>
</tr>
<tr>
<td>Macon</td>
<td>3.65</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Marshall</td>
<td>5.17</td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>Maury</td>
<td>4.43</td>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>Montgomery</td>
<td>6.23</td>
<td>25</td>
<td>11</td>
</tr>
<tr>
<td>Moore</td>
<td>5.67</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Robertson</td>
<td>3.20</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>Rutherford</td>
<td>2.83</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>Smith</td>
<td>6.04</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>Sumner</td>
<td>4.80</td>
<td>19</td>
<td>12</td>
</tr>
<tr>
<td>Trousdale</td>
<td>4.91</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Wayne</td>
<td>3.55</td>
<td>19</td>
<td>3</td>
</tr>
<tr>
<td>Williamson</td>
<td>2.92</td>
<td>13</td>
<td>4</td>
</tr>
<tr>
<td>Wilson</td>
<td>3.80</td>
<td>16</td>
<td>5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>359</td>
<td>130</td>
<td>29</td>
</tr>
<tr>
<td>REGION 3</td>
<td>Deer Population</td>
<td>Hazards</td>
<td>Sample Points</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------</td>
<td>---------</td>
<td>---------------</td>
</tr>
<tr>
<td></td>
<td>Deer Density (/mi²)</td>
<td>Sample Points</td>
<td>Processors &amp; Taxidermists</td>
</tr>
<tr>
<td>Bledsoe</td>
<td>1.94</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Bradley</td>
<td>2.71</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Clay</td>
<td>3.05</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Cumberland</td>
<td>2.35</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>DeKalb</td>
<td>2.71</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Fentress</td>
<td>1.11</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Grundy</td>
<td>2.26</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Hamilton</td>
<td>2.93</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>Jackson</td>
<td>4.78</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>Marion</td>
<td>2.53</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>McMinn</td>
<td>3.53</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>Meigs</td>
<td>4.58</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Monroe</td>
<td>0.95</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Morgan</td>
<td>1.41</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Overton</td>
<td>2.90</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Pickett</td>
<td>2.17</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Polk</td>
<td>0.38</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Putnam</td>
<td>3.24</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Rhea</td>
<td>3.81</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Roane</td>
<td>3.73</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>Sequatchie</td>
<td>2.12</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Van Buren</td>
<td>2.63</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Warren</td>
<td>2.09</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>White</td>
<td>3.10</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>177</td>
<td>97</td>
<td>26</td>
</tr>
</tbody>
</table>
### Deer Population

<table>
<thead>
<tr>
<th>Region</th>
<th>Deer Density (/mi²)</th>
<th>Sample Points</th>
<th>Processes &amp; Taxidermists</th>
<th>Cervid Facilities</th>
<th>CWD Surveillance</th>
<th>Risk Score</th>
<th>Sample Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anderson</td>
<td>1.77</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Blount</td>
<td>0.95</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>45</td>
<td>26</td>
<td>30</td>
</tr>
<tr>
<td>Campbell</td>
<td>1.09</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>30</td>
<td>23</td>
<td>27</td>
</tr>
<tr>
<td>Carter</td>
<td>3.22</td>
<td>8</td>
<td>11</td>
<td>1</td>
<td>45</td>
<td>38</td>
<td>46</td>
</tr>
<tr>
<td>Claiborne</td>
<td>2.58</td>
<td>8</td>
<td>6</td>
<td>0</td>
<td>45</td>
<td>35</td>
<td>43</td>
</tr>
<tr>
<td>Cocke</td>
<td>1.74</td>
<td>6</td>
<td>4</td>
<td>1</td>
<td>45</td>
<td>32</td>
<td>38</td>
</tr>
<tr>
<td>Grainger</td>
<td>2.03</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Greene</td>
<td>1.62</td>
<td>7</td>
<td>6</td>
<td>0</td>
<td>45</td>
<td>39</td>
<td>46</td>
</tr>
<tr>
<td>Hamblen</td>
<td>2.13</td>
<td>3</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>Hancock</td>
<td>1.97</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>45</td>
<td>22</td>
<td>25</td>
</tr>
<tr>
<td>Hawkins</td>
<td>4.04</td>
<td>15</td>
<td>6</td>
<td>2</td>
<td>45</td>
<td>42</td>
<td>57</td>
</tr>
<tr>
<td>Jefferson</td>
<td>2.58</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>11</td>
<td>17</td>
</tr>
<tr>
<td>Johnson</td>
<td>3.30</td>
<td>7</td>
<td>3</td>
<td>0</td>
<td>60</td>
<td>36</td>
<td>43</td>
</tr>
<tr>
<td>Knox</td>
<td>2.19</td>
<td>8</td>
<td>14</td>
<td>0</td>
<td>0</td>
<td>21</td>
<td>29</td>
</tr>
<tr>
<td>Loudon</td>
<td>5.56</td>
<td>10</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>19</td>
</tr>
<tr>
<td>Scott</td>
<td>0.73</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>30</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>Sevier</td>
<td>0.53</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>45</td>
<td>35</td>
<td>37</td>
</tr>
<tr>
<td>Sullivan</td>
<td>4.48</td>
<td>14</td>
<td>10</td>
<td>1</td>
<td>45</td>
<td>44</td>
<td>58</td>
</tr>
<tr>
<td>Unicoi</td>
<td>1.37</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>45</td>
<td>22</td>
<td>24</td>
</tr>
<tr>
<td>Union</td>
<td>1.43</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Washington</td>
<td>2.30</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>11</td>
<td>17</td>
</tr>
</tbody>
</table>

| TOTAL    | 128                | 110           | 12                       | 570               | 498              | 626        |               |
Acknowledgments
Funding for this project was cooperatively provided by the TWRA and the Wildlife Restoration Program, which derives monies through an excise tax on sporting arms and ammunition paid by hunters and recreational shooters. We thank Joey Woodard and Susan Mann for administrative support. We would like to acknowledge all TWRA biologists, technicians, and wildlife officers who helped collect the data necessary for the risk assessment. We thank Stacy Saxton for assisting with wildlife officer interviews and getting pertinent information from captive cervid operations. We especially would like to thank Russ Skoglund, Tabitha Lavacot, Dan Gibbs, Sterling Daniels, Ben Layton, Walter Cook, and Leith Konyndyk for serving on the action team dedicated to development of this plan.
References


Glossary

**Captive cervid facility** – general term for a location that houses, raises, and sells cervid species or their products (urine, velvet, venison, antlers, shooting opportunities), and permit sometimes required from TWRA or TDA.

Specific types of captive cervid facilities include:

- **High fence** – private property with a high fence (typically 8 ft.) along the border to deter trespassing and prevent cervids from entering or exiting. White-tailed deer, which have been incidentally contained and exotic cervids may be present on these properties. No permit is issued from TWRA or TDA.

- **Non-native** - private property with a high fence (typically 8 ft.) along the border preventing the escape of exotic (non-native) cervids. The regulatory authority for these facilities is TDA since owners do not possess a TWRA Private Wildlife Preserve Permit.

- **Preserve** – private property with a high fence (typically 8 ft.) along the border to deter trespassing and prevent cervids from entering or exiting. Owners hold a permit issued by TWRA authorizing the owner to sell hunts for exotic cervids or domestic elk. Incidentally contained white-tailed deer can be taken according to the statewide hunting seasons and bag limits. Sources of domestic elk or exotic cervids to these facilities must be enrolled in the Tennessee Department of Agriculture Herd Certification Program.

- **Cervid** – hooved mammal that typically grows and sheds antlers yearly, includes deer, elk, and moose

- **Environmental contamination** – prions shed in carcases, urine, feces, and saliva bind to the soil and plants and remain infectious to deer

- **Exotic** – non-native species

- **Hazard** – A condition or physical situation with a potential for an undesirable consequence or to cause harm, e.g., may introduce or spread CWD prions

- **Prevalence** – Number of animals positive for CWD divided by number of animals in the population

- **Prion** – misfolded protein that is the infectious agent of CWD

- **Risk** – Possibility that something unpleasant will happen or situation involving exposure to danger

- **Risk Analysis** – Analytical process to provide information regarding undesirable events


- **Risk Communication** – Information exchange between risk assessors, risk managers, and those affected by both the risk and the decisions taken before the final policy decisions are taken

- **Rehabilitator** – facilities where TWRA has authorized rehabilitation of white-tailed deer under the age of four months
Wildlife health - the vitality and integrity of wildlife species at population levels that support their functional roles in sustaining ecological systems that benefit society and the natural world

Zoo – municipal zoos accredited by the Association of Zoos & Aquariums
Chronic wasting disease (CWD) is a transmissible spongiform encephalopathy of cervidae that causes the loss of weight and eventual death of the infected animal. The spread of this disease could have a severe economic impact on the production of captive cervidae and the cervidae population in the wild. In view of the threat posed by the disease to the health of the state’s livestock and livestock industry, the state veterinarian, pursuant to the authority vested in him by T.C.A § 44-2-102, hereby ORDERS as follows:

Tennessee Chronic Wasting Disease (CWD) Herd Certification Program (HCP)

Although voluntary, participation in this program is required for the interstate movement of CWD susceptible cervidae. This program also provides for the detection and control of CWD in the state of Tennessee.

1. Definitions
   a. Cervid – All members of the Cervidae family and hybrids including deer, elk, moose, caribou, reindeer, and related species.
   
   b. Certified status - is granted after program enrollment of 5 years with no evidence of disease, or identification as a trace-back or trace forward herd. Renewal of “certified” status is contingent upon annual (10-14 months) inspection and continued compliance with program standards.
   
   c. Susceptible Cervidae - The species known to be susceptible to CWD are Rocky Mountain Elk (Cervus canadensis), Red Deer (Cervus elaphus), Mule deer (Odocoileus hemionus), Black-Tailed Deer (Odocoileus hemionus), Sika deer (Cervus nippon), and Moose (Alces alces) or as determined by USDA.

2. Premises Requirements
   
   a. All owners of captive cervidae in Tennessee shall obtain a premise identification number from the Tennessee Department of Agriculture.
   
   b. All cervidae premises that participate in the Tennessee CWD HCP shall have suitable handling facilities to allow inspection, identification, or testing of animals in a safe and humane manner.
c. All captive cervidae premises established subsequent to the effective date of the National CWD Rule (Aug 12, 2012), shall be enclosed by perimeter fences at least 8 feet in height and must be structurally sound, maintained in good repair, and of sufficient construction to prevent ingress and egress of farmed and free-ranging wild cervids/animals.

d. In herd premises already existing at the time of the effective date of the National CWD Rule (Aug 12, 2012), fencing must comply with the previous TN State policy requiring a minimum of six foot perimeter fencing.

3. Identification Requirements

a. Each animal 12 months of age or older (and animals under 12 months of age leaving the premises), shall have a minimum of two forms of animal identification. One of these animal identifications must be a nationally unique official animal identification. The official animal identification device must be a device approved by APHIS, and must be an 840 visual tag, 840 radio frequency identification device (RFID), electronic implant (840 RFID injectable transponder / microchip), steel USDA tag or other approved device. Information on official animal identification devices can be found on the APHIS Traceability website at the following address:

b. The second form of identification must be a unique form of identification to that animal in the herd and can be any official animal identification device listed above or a farm bangle tag or ear/flank tattoo.

c. Animals that lose their identification should be retagged as soon as possible. All animals 12 months of age or older must have individual identification and reconciled in herd records before the herd status can be advanced.

4. Enrollment, Inspections and Record Keeping Requirements

a. After receipt of an enrollment application for the CWD HCP, an initial complete physical herd inventory is required as well as a recording of all individual identification. Records shall be reconciled during inspections and inventories. These inspections and inventories shall be submitted on an inspection form supplied by the state veterinarian’s office and signed by an accredited veterinarian or by state or federal personnel. Owners are responsible for assembling, handling, and restraining animals for physical inventories or other inspections under conditions that will allow the accredited veterinarian, APHIS employee, or State Official to safely read all identification on the animals. The owners are responsible for the costs that may be incurred to present the animals for inspection and must agree that any liability or injury to the animals during handling rests with the owner.
b. Inspections shall be conducted annually. Physical inventories shall be conducted every three years by state or federal animal health officials or TN accredited veterinarians. Annual inspections consist of an inspection of the facility, a visual inspection of the herd including a count of the cervids and verification that each cervid twelve months of age or older has at least one official visible individual identification. Physical inventories shall be conducted in such a manner that the two forms of identification on each animal twelve months of age or older can be read and recorded. Both annual and physical inventories should correspond with herd records.

c. Participants in the CWD HCP shall submit their herd inventories in a format prescribed by the state veterinarian’s office. Herds may not advance in status until the annual inspections have been completed, submitted, reconciled, and approved.

d. Herd records must be maintained that include a complete inventory of animals that states the species, age, and sex of each animal; the date of acquisition and source of animals not born into the herd; the date of disposal and/or destination of animals removed from the herd; and all individual identification numbers associated with each animal.

e. Animals can only be introduced into an enrolled herd from herds that are the same or higher status in the national CWD HCP in order to maintain their existing status. Should animals with a lesser program status be introduced into the herd, the herd will revert to the status of the newly introduced animals.

f. Documentation of any deaths, interstate movements, or any other disposition of animals since the last inventory shall be included in the records. Annual herd inventories shall be completed between 10 to 14 months of the enrollment date and within 10 to 14 months of the anniversary date thereafter.

5. Reporting and Testing Requirements

a. Immediate reporting of all deaths 12 months of age or older and subsequent CWD testing of those mortalities at the owner’s expense shall be required and documented by an accredited veterinarian or state or federal personnel. Testing shall be performed by the National Veterinary Services Laboratory in Ames, IA. All lab results must be received by the state veterinarian. Exemptions may be approved only by the state veterinarian after consultation with the herd owner and herd veterinarian.
i. Tissues from all CWD-exposed or CWD-suspect animals that die or are depopulated must be submitted for testing regardless of the age of the animal.

ii. Carcasses and tissues from sampled animals must be disposed of in accordance with State regulation. Remains of CWD-positive or CWD-exposed shall be disposed of in compliance with all Federal, State and local regulations as approved by the State Veterinarian.

iii. All deaths of cervidae and any animal exhibiting signs of CWD shall be immediately reported to the Tennessee State Veterinarian.

6. Epidemiologic Investigations

a. All animals reported as CWD-suspects will be investigated promptly.

b. An epidemiologic investigation will be conducted of CWD-positive, CWD-exposed, and CWD-suspect herds that will include the designation of suspect and exposed animals, identifying animals to be traced. States that are found to have received any animals involved in a trace will be notified immediately.

c. Trace-backs of CWD-positive animals and trace-ouits of CWD-exposed animals will be conducted. Appropriate states will be notified promptly after notification of a CWD positive animal has been received.

d. Trace-backs based on slaughter or other sampling will be conducted promptly after receipt of notification of a CWD-positive animal at slaughter.

e. If herds are found to have CWD-positive, CWD-exposed, or CWD-suspect animals, the herd will be designated as such and the herd will be promptly quarantined until it has been determined if the herd contains or has contained a CWD-positive animal.

f. Designated herds will be subjected to a herd plan as developed by the TN State Veterinarian with completion of herd plan requirements before quarantines are removed. “Certified” status also would be suspended.

7. Enforcement

a. Captive cervidae escaping their premises shall be immediately reported to the state veterinarian’s office and recaptured by the owner within 72 hours of
escape. If an escaped farm-raised cervid is returned to the herd more than 72 hours after it escapes, it loses any status that it may have had in a herd certification or herd status program and is treated as a new addition to the herd.

b. “Certified” status is granted after program enrollment of 5 years with no evidence of disease or herd designation. Renewal of “certified” status is contingent upon annual inspection, sampling and continued compliance with program standards.

c. “Certified” status may be revoked for failure to comply with program standards and requirements as provided in this order.

IT IS SO ORDERED

[Signature]

Charles W. Hatcher, DVM
State Veterinarian
Appendix C: Supplies Needed for Collecting CWD Samples.

Scalpel Handles
Scalpel Blades
Sharps Containers
Stainless Steel Knives—Swiss Army from Amazon
Deer Jaw Spreaders—Forestry Suppliers
Whirl Pak Bags—U Line
Permanent Fine-tipped Markers—Staples
Water Resistant Paper—Forestry Suppliers
Styrofoam Insulated Shipping Boxes—Uline
Blue Ice Packs—Uline
Nitrile Gloves—Fisher Scientific Bleach—Walmart
Hand Sanitizer—Walmart Freezers—1 in each region
Appendix D: Additional supplies, equipment and facilities needed for CWD response.

**Animal Collection**

- Rifles and Ammo
- Night vision Scopes
- Spotlights

**Personal Protection**

- Tyvek suits
- Coveralls
- Rubber Boots
- Face shields/goggles
- N95 respirators

**Transport/Storage Equipment**

- Covered Trailers
- Large Plastic Totes w/ lids
- Tackle Boxes
- Freezers (emergency purchase)
- Refrigerators (emergency purchase)

**Specimen Handling**

- Large poly tarps (10X10 etc.)
- Heavy Plastic Sheeting
- Poly Rope
- Bungee cords
- Paper Tags w/ wire
- Trash Bags
- Adhesive Labels
- Large Plastic Zippered Bags
- Small Plastic Zippered Bags
- Large Coolers
- Biological Substance, Category B / UN3373 labels
Cleaning and Disinfecting

Plastic Wash Tubs
LpH sterile disinfectant
Lifeguard or Cidex disinfectant
Autoclave
Sharps containers
Paper Towels
Incinerators (emergency purchase)

Surgical

Stainless Steel Tables
Folding Chairs
Jars w/ 10% Buffered Neutral Formalin
Forceps
Scalpel Handles and Blades
Stainless Steel Pans
Spray Lubricant (e. g. WD40)
Needle Nose Pliers
Surgical Scissors
Stainless Steel Surgical Trays
Jaw Cutters
Plastic Buckets

Data Handling

Lap Top Computers with Internet Connection
Programs for Recoding Data and Preparing Reports

Facilities

A building with water, a concrete floor, and a lot of space to work in to process samples that is heated and air conditioned (e.g., Necropsy room)

Incinerator to dispose of carcasses (requires permitting from TDEC)
Appendix E: TWRA notification sequence for preliminary positive chronic wasting disease.

Statewide Disease Coordinator: Roger Applegate
Executive Director: Ed Carter
Chief of Wildlife: Joe Benedict
Assistant Director of Field Operations: Bobby Wilson
Chief of Boating and Law Enforcement: Darren Rider
Regional Wildlife Program Managers:
  Region 1-Jim Hamlington
  Region 2-Richard Kirk
  Region 3-Vacant
  Region 4-John Mike
Asst. Chief of Wildlife: Kirk Miles
Captive Wildlife Coordinator: Walter Cook
Regional Law Enforcement Majors:
  Region 1-Brian Thompson
  Region 2-Robert Bailey
  Region 3-C. J. Jaynes
  Region 4-Brian Ripley
Deer Program Leader: James Kelly
Elk Program Leader: Brad Miller
Chairman of TN. Fish and Wildlife Commission (TFWC): Jeff Cook
Chairman of the Wildlife Mgmt. Committee for the TFWC: Kurt Holbert
Appendix F: TWRA notification sequence for a confirmed positive chronic wasting disease test.
Appendix G: TWRA Chronic Wasting Disease Media Team.

TWRA Wildlife Veterinarian: Daniel Grove
Chief of Communications and Outreach: Jenifer Wisniewski
Regional Information Officers:
  Region 1 – Amy Snider
  Region 2 – Barry Cross
  Region 3 – Mime Barnes
  Region 4 – Matt Cameron
Chief of Wildlife & Forestry: Joe Benedict
Asst. Chief of Wildlife & Forestry: Kirk Miles
Appendix H: TWRA Chronic Wasting Disease Administrative Team.

Assistant Director of Field Operations: Bobby Wilson
TWRA CWD Coordinator: Chuck Yoest
Chief of Wildlife & Forestry: Joe Benedict
Chief of Boating & Law Enforcement: Darren Rider
Chief of Information & Education: Don King
Chief of Communications and Outreach: Jenifer Wisniewski
Legal Division Representative: Tracey Boyers
Chief of Information Technology: Mark Ridings
Appendix I: TWRA CWD Field Response Team. The Field Response teams will be comprised of selected TWRA staff from the Wildlife & Forestry Division, Law Enforcement Division, GIS support, and other staff as needed, depending on field circumstances and needs.

Assistant Chief of Wildlife & Forestry: Kirk Miles
Statewide Disease Program Leader: Roger Applegate
Statewide Deer Program Leader: James Kelly
Statewide Elk Program Leader: Brad Miller
Statewide Captive Wildlife Program Leader: Walter Cook
Regional Wildlife Program Managers:
  Region 1 - Jim Hamlington
  Region 2 - Richard Kirk
  Region 3 - Vacant
  Region 4 - John Mike
Regional Law Enforcement Majors:
  Region 1 - Brian Thompson
  Region 2 - Robert Bailey
  Region 3 - C.J. Jaynes
  Region 4 - Brian Ripley
Regional Deer Biologists:
  Region 1 – Daniel Stanfield
  Region 2 – Russ Skoglund (North) & Tabitha Lavacot (South)
  Region 3 – Ben Layton
  Region 4 – Dan Gibbs
GIS Support: Lynn Barrett