VIRGINIA DEPARTMENT OF WILDLIFE RESOURCES

2021 – 2025 CHRONIC WASTING DISEASE MANAGEMENT PLAN

Rev. 04/2021

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INTRODUCTION

Chronic wasting disease (CWD) is a slowly progressive, neurodegenerative, and ultimately fatal disease that affects members of the family Cervidae. CWD is classified as a naturally occurring transmissible spongiform encepahalopathy (TSE), along with scrapie, bovine spongiform encephalopathy, and Creutzfeldt-Jakob disease (Williams and Young 1980). The causative agent of CWD is an infectious protein, called a prion, which slowly accumulates in the central nervous system and causes "sponge-like" changes to the associated tissues, leading to neurological impairment (Prusiner 1982, Williams 2005, Angers et al. 2009). While prions tend to congregate in the oropharyngeal, nervous, and lymphatic tissues (Hoover et al. 2017), they have also been detected in the saliva, feces, urine, blood, muscle, and antler velvet of infected individuals (Mathiason et al. 2006. Angers et al. 2009, Haley et al. 2009, Tamgüney et al. 2009). There is no known effective treatment or vaccine for CWD.

Chronic wasting disease infection leads to a protracted course of disease (Williams 2005). The average incubation period of cervids varies from 1.5 to nearly 3 years (Williams and Miller 2002) and, despite the absence of any signs of illness, infected animals begin shedding infectious prions in various bodily fluids and excrement shortly after infection (Mathiason et al. 2009, Tamgüney et al. 2009, Henderson et al. 2015). Clinical signs of CWD include loss of body condition and weight, excessive salivation, loss of fear of human, tremors or staggering, drooping head or ears, and apparent lack of awareness (Williams and Young 1980). Clinical signs are typically only exhibited in the weeks or months just prior to death (Williams 2005).

Chronic wasting disease is believed to be one of the most infectious TSEs and spreads highly efficiently amongst cervids (Miller and Williams 2003, Sigurdson and Aguzzi 2007, Nalls et al. 2013). Research and circumstantial evidence suggest that CWD is spread via direct contact with infected animals, carcasses, urine, feces, saliva, and other bodily fluids (Miller et al. 2004, Miller et al. 2006, Mathiason et al. 2009, Saunders et al. 2012) and because of prion contamination of the environment (Miller and Williams 2003, Safar et al. 2008). CWD prions are extremely environmentally resistant and remain infectious in the soil for at least two years post-deposition (Miller et al. 2004, Saunders et al. 2008). Plants have been shown to uptake prions from the soil, thereby making them available for consumption by herbivorous animals (Pritzkow et al. 2015). Vertical transmission (in utero) has been suggested in elk and reported in muntjac but the role of either vertical or maternal (exposure to prions via ingestion of milk or colostrum from an infected dam) transmission in the epidemiology of the disease is not clear (Grear et al. 2006, Nalls et al. 2013, Selariu et al. 2015).

Prion diseases often exhibit a narrow host range and are rarely diagnosed in humans (Raymond et al. 1997, Raymond et al. 2000, MaWhinney et al. 2006). Although human exposure to CWD has certainly occurred as a result of the harvesting of deer and elk by millions of hunters in the United States since the 1980's, the Centers for Disease Control and Prevention (CDC) have not established a known link between CWD and any human neurological disease (MaWhinney et al. 2006). In addition, circumstantial evidence and research suggests that the risk of transmission to humans is low (Kurt et al. 2015, Waddell et al. 2018). However, experimental CWD research involving squirrel monkeys and macaques (Race et al. 2014, Czub 2017, Race et al. 2018), a monkey that is fairly genetically similar to

humans, in combination with the possible decades-long incubation of CWD in people, suggest that human exposure to CWD should be avoided. The CDC therefore advises hunters to both avoid consumption of venison harvested from known CWD-positive animals and to test any cervid harvested in an area known to be affected by the prion disease prior to consumption.

The complex nature of CWD, most notably the protracted incubation period, the prolonged shedding of prions by infected individuals prior to the appearance of clinical signs, and the extended persistence of prions on the landscape, render management of the disease in a free-ranging population extremely difficult (Williams and Miller 2002). To date, most CWD management strategies have relied heavily on reducing population densities and removing localized disease foci via hunter harvest and/or agency culling (Williams et al. 2002, Blanchong et al. 2006, Connor et al. 2007, Mateus-Panilla et al. 2013). Strategies to reduce infection rate that rely predominately on lowering cervid densities via female-focused or herd-control harvest assume that CWD transmission is density-dependent (infection rate is determined by host density), whereas many models suggest that CWD is frequency-dependent (infection rate is independent of host density and is associated with contact in particular social groups) or a combination of the two (Gross and Miller 2001, Schauber and Woolf 2003, Grear et al. 2006, Wasserberg et al. 2009, Jennelle et al. 2014). There is little published information describing effective management approaches (Miller and Fischer 2016, Uehlinger et al. 2016) but various models suggest that harvest focused on antlered deer most consistently reduces disease prevalence (Jennelle et al. 2014, Patapov et al. 2016). Recent research in Wyoming reported population-level declines in both mule deer and white-tailed deer that are directly attributable to CWD (Edmunds et al. 2016, DeVivo 2017), demonstrating the need to continue to develop, execute, and evaluate new management strategies.

GOALS

The dynamic nature of many wildlife diseases often leads to planning and logistical challenges. While the continuously expanding geographic scope and apparent prevalence of disease may alter the allocation of resources, the effectiveness of novel harvest strategies (antlered and/or antlerless), landscape or land use changes, available funding, recent harvest rates, etc. may also alter annual surveillance and monitoring strategies. This plan is designed to encourage annual review of CWD monitoring/surveillance data, deer harvest data, and current deer population objectives, in combination with current harvest strategies and regulatory actions, to maximize flexibility and adaptation in the face of continually changing available resources and a dynamic disease landscape.

The goals of the Virginia Department of Wildlife Resources, as they pertain to CWD management, include the following:

1. Sustain deer populations,
2. Address human health concerns, and
3. Preserve Virginia's deer hunting heritage.

The DWR CWD Management Plan aims to achieve these Agency goals via the development of a complementary set of focused goals, followed by a list of strategies suggested by the plan to achieve the goals.

The goals of the DWR CWD Management Plan include the following:

1. Prevent introduction of CWD into new areas of Virginia,
2. Optimize sampling efficiency,
3. Detect CWD in new areas of Virginia at low apparent prevalence levels, and
4. Minimize geographic spread and reduce transmission in areas where CWD is known to occur

Strategies included in the DWR CWD Management Plan to meet these goals include the following:

1. Monitor apparent prevalence and spatial distribution of CWD in areas where the disease is known to occur,
2. Evaluate efficacy of proposed and existing management strategies and actions in reducing transmission and geographic spread of disease,
3. Increase public support for Department efforts to control the spread,
4. Increase compliance with Virginia laws and regulations intended to control the spread of CWD, and
5. Engage and communicate effectively with Department staff, stakeholders, and other partners in a timely, meaningful, and efficient manner

HISTORY OF CWD IN VIRGINIA

Following the discovery of CWD in Wisconsin in 2002, the Virginia Department of Wildlife Resources (DWR) developed a surveillance and response plan for the disease and initiated CWD surveillance in Virginia. Beginning in 2005, when CWD was first detected in Hampshire County, West Virginia, DWR began to focus CWD surveillance in adjacent counties. In 2009, active surveillance was conducted in an area of western Frederick and Shenandoah Counties that were closest to the positive cases in West Virginia.

Virginia's first case of CWD was confirmed in a 2.5-year-old female white-tailed deer harvested by a hunter on November 14, 2009, in western Frederick County. A Containment Area (CA) was established in the western and northern portions of Frederick and Shenandoah counties, respectively. The first CWD detection in Shenandoah occurred in 2014. Due to continued geographic spread of the disease, the CA area was expanded in 2015 to include Clarke, Frederick, Shenandoah, and Warren counties. In 2018, DWR initiated a statewide targeted CWD surveillance strategy to optimize sample effort by focusing on older males. The majority of samples collected via this strategy were submitted to cooperating taxidermists. Through this effort, CWD was confirmed in a hunter-harvested adult male white-tailed deer originating from Culpeper County. In 2019, the term "Containment Area" was exchanged for a more accurately descriptive term, "Disease Management Area", and Clarke, Frederick, Shenandoah, and Warren counties were re-designated Disease Management Area 1 (DMA1) and Culpeper, Madison, and Orange counties were designated DMA2. Further spread of the disease into Fauquier County in 2019 necessitated an expansion of DMA2 to include Fauquier, Page, Loudoun, and Rappahannock counties. A single CWD detection was confirmed in Montgomery County in 2020 and resulted in the creation of DMA3 (Floyd, Montgomery, and Floyd counties).

County	Hunter-Harvest	Road-Kill	Clinical Suspects
Clarke	2	0	0
Culpeper	1	0	0
Fauquier	2	0	0
Frederick	80	5	2
Loudoun	1	0	0
Madison	1	0	0
Montgomery	1	0	0
Rappahannock	1	0	0
Shenandoah	9	1	2
Warren	1	0	0
Total	90	6	4

Figure 1. Summary of CWD detections in Virginia, 2009 – 2020.

Year	Number Tested	CWD Detections
2009	340	1
2010	593	1
2011	1,664*	2
2012	351	1
2013	422	2
2014	698	3
2015	1,597	3
2016	1,545	9
2017	1,805	16
2018	3,284**	29
2019	5,653**	21
2020	5,729**	21
Total	23,681	109

* Statewide surveillance conducted ** Targeted statewide surveillance conducted

Figure 2. CWD testing summary in Virginia, 2009 – 2020.

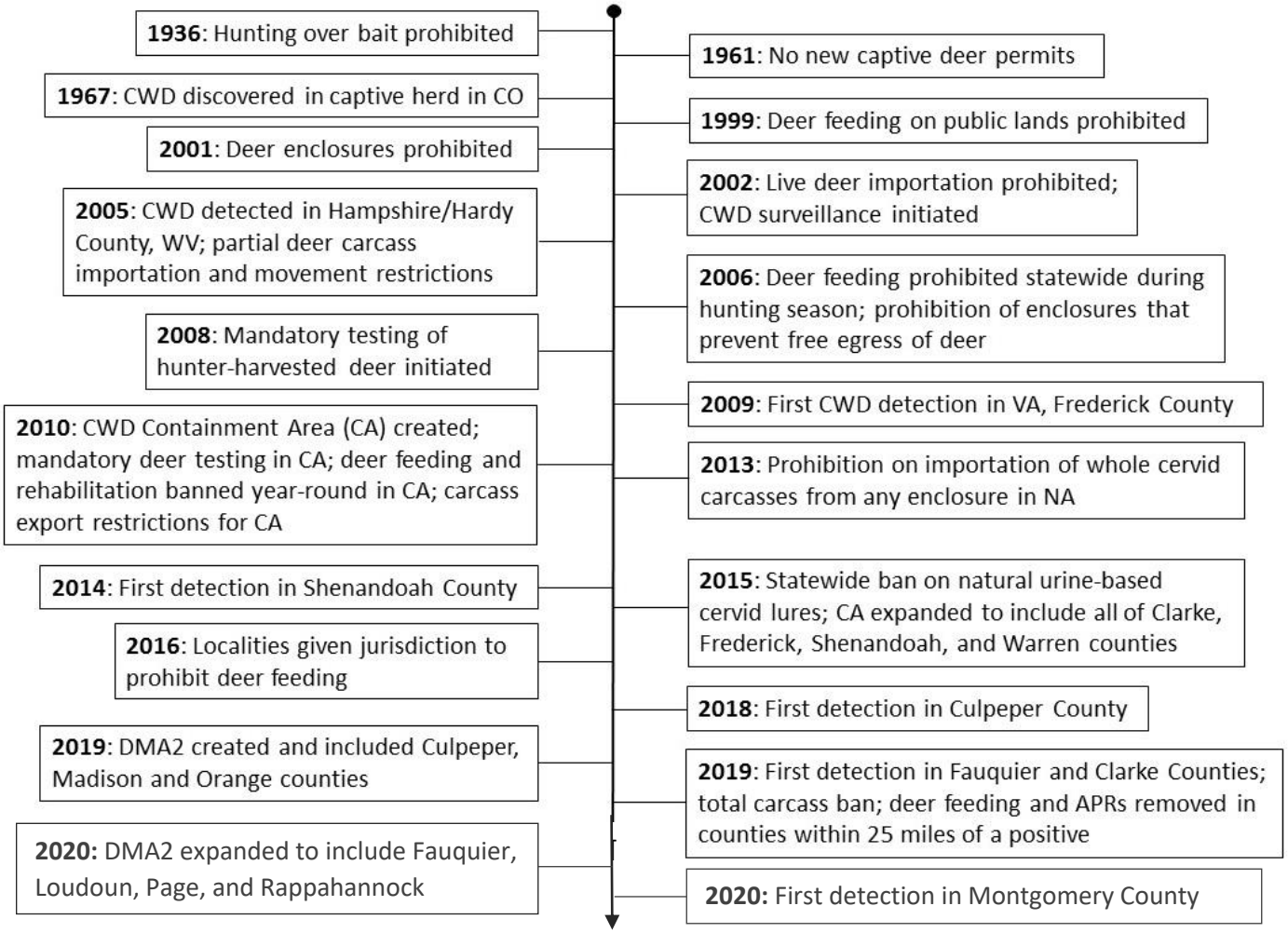

Figure 3. Timeline of deer feeding, captive cervid, carcass transport, CWD testing, and CWD management regulations in Virginia.

USING AN ADAPTIVE MANAGEMENT FRAMEWORK FOR CWD

DWR is incorporating an adaptive management framework into its approach to wildlife disease outbreaks, which facilitates learning from management decisions and allows flexibility to change disease management strategies based upon effectiveness, continually evolving research, and public acceptance. An adaptive management approach that allows for the application, evaluation, and improvement of CWD suppression strategies after collection and analysis of data is recommended by the Association of Fish and Wildlife Agencies (Gillin et al. 2018) and the Western Association of Fish and Wildlife Agencies (WAFWA 2017). Using an adaptive management framework, deer management practices in Management Level I and Management Level II Counties may be influenced by new and ongoing research aimed at demonstrating how CWD spreads on the landscape and the effectiveness of CWD management actions and suppression strategies in these counties will be continually evaluated.

COMMUNICATION STRATEGY

A consistent message throughout the DWR CWD Plan is the goal of engaging and communicating effectively with Department staff, stakeholders, and other partners in a timely, meaningful, and efficient manner. As such, CWD communication strategies and pathways are clearly delineated in a companion 2021 – 2025 DWR CWD Detection Notification Plan.

INITIAL RESPONSE TO TRIGGER AND BORDER DETECTIONS

A **trigger detection** is defined as the first CWD detection in a county. A **border detection** is defined as:

1. **Out-of-state**: CWD detection located within 10 miles of a Virginia county not included in a DMA
2. **In-state**: CWD detection within a DMA county that is located less than 10 miles from a Virginia county that is not included in a DMA

Trigger and border detections initiate consideration of a well-planned, thoughtful response that may result in either the creation of a new DMA or re-evaluation of current DMA boundaries.

The type of initial response to a **trigger detection** will vary according to the following parameters:

1. Prior inclusion of the trigger county in a DMA,
2. Adjacency of the trigger county to a DMA,
3. Hazard score of the trigger county, and
4. Time of year of detection.

The type of initial response to a **border detection** will vary according to the following parameters:

1. Distance to a non-DMA county (in-state border detection),
2. Hazard score of the county(ies) adjacent to an out-of-state border detection, and
3. Time of year of detection.

Please refer to the DWR CWD Detection Notification Plan for additional details regarding communication protocols and frameworks.

Goals of the initial response to a CWD trigger or border detection include the following:

1. Confirm CWD positive-status as quickly as possible (trigger and in-state border detections),
2. Minimize geographic spread of disease and reduce disease transmission,
3. Determine apparent prevalence and spatial distribution of disease within 12 months post-confirmation, and
4. Engage and communicate effectively with Department staff, stakeholders, other partners, the public, and the media in a timely, meaningful, and efficient manner.

Strategies to meet these initial response goals include the following:

CONFIRM DETECTION (TRIGGER AND IN-STATE BORDER DETECTIONS ONLY)

1. Preliminary testing laboratory to submit the lymph node tissue to the National Veterinary Services Laboratory (NVSL) as a quality review submission
    - Declare trigger detection laboratory confirmed when positive IHC results are returned from NVSL
2. Wildlife Disease Biologist or District Wildlife Biologist to submit tissues for DNA comparison analysis if the following conditions are met:

iia. County is not already included in a DMA OR

iib. If county is already included in a DMA, it is classified as a border detection, and

iii. Suitable tissue samples that can confidently be paired to the CWD-positive deer are available for comparison with the lymph node tissue
    - Examples:
        - Antlers, skull, or European mount that definitely corresponds to the CWD-positive deer via photographs or other corroboration

3. Declare a detection "location confirmed" according to the following timeline:
    i. **Road-kill and clinical suspects**: Immediately post-collection of sample
    ii. **Hunter-harvested deer, no samples submitted for DNA comparison analysis**: After LE confirms the location of harvest with the hunter and obtains GPS coordinates
    iii. **Hunter-harvested deer, samples submitted for DNA comparison analysis**: After LE confirms the location of harvest comparison with the hunter and obtains GPS coordinates and DNA comparison analysis results are returned

MINIMIZE GEOGRAPHIC SPREAD OF DISEASE AND REDUCE DISEASE TRANSMISSION

1. Evaluate county-level CWD monitoring data, private land deer population status, and deer population objectives for each county newly added to a DMA
    i. If the private land deer population status does not match the deer population objective, increase antlerless harvest the following deer hunting season by initiating new or additional harvest strategies
        a. Examples include, but are not limited to, the following: EAB, early September general firearms antlerless season, extension of the general firearms season, etc.
        b. Detections that are laboratory confirmed after April will not result in modified hunting seasons until the following calendar year
            i. No public engagement or formal declarations will occur until location is confirmed
2. Before May 1:
    ii. Formally announce the boundaries of the new or expanded DMA
    iii. Restrict carcass transport out of any counties or clearly demarcated portion of counties newly added to a DMA
    iv. Prohibit rehabilitation of fawns originating from within the DMA and prohibit rehabilitation facilities located within the DMA from rehabilitating fawns
    v. Institute or continue a year-round deer feeding ban in any counties located within 25 miles of the trigger detection
    vi. Remove antler point restrictions from all counties within 25 miles of the border detection
3. Within three months of the conclusion of the following hunting season, analyze the CWD monitoring data for each county newly added to a DMA and classify each county as a Management Level I or Management Level II County

DETERMINE APPARENT PREVALENCE AND SPATIAL DISTRIBUTION OF DISEASE

1. Increase passive surveillance by investigating all credible reports of clinical suspects received from the public
2. Consider initiation of in-season preliminary monitoring in counties/areas within 10 miles of the detection if:
    i. **Trigger detections only**: County is not already included in a DMA OR
    If the county is already included in a DMA, the detection is also classified as a border detection
    ii. CWD positive-status is confirmed and information is released to the public with at least four weeks of the hunting season remaining,
    iii. Due to *timing* of the confirmation, the detection did not result in an expanded or new DMA for the current or upcoming hunting season (i.e., confirmed between May and January),
    iv. Fewer than 150 deer per county were tested for CWD the previous three years *combined*, and
    v. County hazard score(s) is moderate or high.
3. Consider initiation of post-season preliminary monitoring in counties/areas within 10 miles of the detection if:
    i. **Trigger detections only**: County is not already included in a DMA OR
    If the county is already included in a DMA, the detection is also classified as a border detection
    ii. CWD-positive status is confirmed and information is released to the public by the end of January,
    iii. Due to *timing* of the confirmation, the detection did not result in an expanded or new DMA for the current or upcoming hunting season (i.e., confirmed between May and January),
    iv. Fewer than 150 deer per county were tested for CWD the previous three years *combined*, and
    v. County hazard score(s) is moderate or high.
4. Initiate plans for enhanced monitoring in the newly created DMA or new additions to an existing DMA for the following hunting season
5. Consider enhanced surveillance in counties adjacent to the DMA
6. Consider the creation of Disease Focus Zone(s) for the following hunting season for isolated detections located more than 5 miles from the nearest CWD detection
7. Evaluate the apparent prevalence and spatial distribution of disease for each new county or part of a county added to a DMA at the conclusion of the next deer hunting season and determine if the county is a Management Level I or Management Level II County

ENGAGE AND COMMUNICATE EFFECTIVELY WITH DWR STAFF, STAKEHOLDERS, PARTNERS, PUBLIC, AND MEDIA

1. If directed by the DWR CWD Detection Notification Plan, convene a virtual or in-person meeting with Local DWR CWD Management Team
    i. Items to discuss:
        a. Counties to be added to a DMA
        b. Counties located within 25 miles of the border detection
        c. Re-calculate hazard score(s) for new DMA counties
        d. Appropriate short-term (to be initiated within the next one to six months) response actions
    ii. Topics to consider:
        a. *Potential public health concerns*: Voluntary CWD testing sites
        b. *Apparent prevalence and disease distribution assessments*: Processor-assisted CWD sample collection effort and/or voluntary CWD testing sites (in-season), kill-permit holder-assisted CWD sample collection effort (post-season), road-kill sampling, etc.
        c. *Disease transmission reduction*: Family group removal via sharp-shooting/specialized hunts, initiation of Disease Focus Zones, etc.
2. Refer to the 2020 – 2024 DWR CWD Detection Notification Plan for additional details regarding communication protocols, frameworks, and timelines of internal and external communications

MANAGEMENT LEVEL I COUNTIES AND AREAS

Management Level I designation identifies areas where the most aggressive *management* strategies are most appropriate. Management Level 1 counties are endemic for CWD, contain endemic areas or, due to proximity to an endemic area or county, are at an elevated risk for CWD spread and establishment. Management Level I designation also include Disease Focus Zones.

A county will be classified as **Management Level I** if it is included in a DMA and if *any* of the following conditions are met:

1. Apparent prevalence in a 5- or 10-mile radius area around any detection is greater than 5%,
2. County-level apparent prevalence is greater than 2%,
3. Extensive spatial distribution of CWD is noted throughout the county, regardless of county-level and 10-mile radius apparent prevalence estimates, or
4. Assessment by the local CWD management team determines that the risk of CWD spread and establishment is high enough to warrant management actions consistent with adjacent Management Level I county or counties. Factors to consider include, but are not limited to, proximity to an endemic area or county, detection of clinically affected animals within the county or within 5 miles of the county border, level of historical CWD surveillance, etc.

Goals to be accomplished in a Management Level I County or DFZ include:

1. Minimize geographic spread of disease and reduce disease transmission,
2. Monitor apparent prevalence and spatial distribution of disease or detect disease at a low apparent prevalence,
3. Evaluate efficacy of proposed and existing management strategies and actions in reducing transmission and geographic spread of disease, and
4. Engage and communicate effectively with Department staff, stakeholders, other partners, the public, and the media in a timely, meaningful, and efficient manner.

Strategies to meet these Management Level I goals include the following:

MINIMIZE GEOGRAPHIC SPREAD OF DISEASE AND REDUCE DISEASE TRANSMISSION

1. Change current private land deer population objectives to less than or equal to 2.0 antlered deer harvested per square mile of habitat
2. Assess county-level harvest data, CWD monitoring data, private land deer population status, and deer population objectives annually
    i. If the private land deer population status does not match the deer population objective, increase antlerless harvest the following deer hunting season by initiating new or additional harvest strategies. Examples include, but are not limited to, the following:
        a. Full-season either-sex in every season
        b. 1:1 earn-a-buck
        c. Extended general firearms season
            1. 7-week general firearms season

2. September antlerless season
3. January – end of March antlerless season

d. Unlimited antlerless harvest

3. Increase antlered deer harvest by introducing new or additional antlered deer harvest strategies. Examples include, but are not limited to, the following:
    i. Extra antlered deer tags valid for use only in specified counties/DFZs
    ii. Align the start of the general firearms season with the initiation of the early muzzle loader season
4. Authorize male deer to be killed off a kill permit
5. Initiate or continue DFZ(s) for isolated detections located more than 5 miles from the nearest CWD detection
6. Restrict carcass transport to other Management Level I Counties
7. Encourage hunters to double-bag leftover carcass parts and dispose in a landfill

MONITOR APPARENT PREVALENCE AND SPATIAL DISTRIBUTION OF DISEASE OR DETECT DISEASE AT LOW APPARENT PREVALENCE

1. Continue year-round passive surveillance by investigating clinical suspect reports from the public until at least two clinical suspects have been confirmed in the county
2. Conduct annual baseline or enhanced monitoring
    i. Aim to test at least 150 deer over a three-year period, at minimum
    ii. Consider conducting an enhanced monitoring level effort once every 5 years
3. Consider initiation or continuation of enhanced surveillance in counties adjacent to the DMA
4. Evaluate apparent prevalence in a 5- and 10-mile radius area around the trigger detection and/or in any other area where endemic status is suspected

EVALUATE MANAGEMENT STRATEGIES AND ACTIONS FOR EFFECTIVENESS IN REDUCING TRANSMISSION AND GEOGRAPHIC SPREAD OF DISEASE

1. Collaborate with notable CWD researchers to develop potential new harvest strategies that may influence apparent prevalence trends and geographic spread
2. Collaborate with notable CWD researchers to develop models to assess the effect of a management strategy or action on apparent prevalence trends or geographic spread

ENGAGE AND COMMUNICATE EFFECTIVELY WITH DWR STAFF, STAKEHOLDERS, PARTNERS, PUBLIC, AND MEDIA

1. Refer to the 2020 – 2024 DWR CWD Detection Notification Plan

MANAGEMENT LEVEL II COUNTIES

A county will be classified as **Management Level II** if all of the following conditions have been met:

1. County is included in a DMA, and
2. County is not classified as Management Level I.

Goals to be accomplished in a Management Level II County include:

1. Monitor apparent prevalence and spatial distribution of disease or detect disease at a low apparent prevalence,
2. Minimize geographic spread of disease and reduce disease transmission to prevent meeting Management Level I criteria,
2. Evaluate efficacy of proposed and existing management strategies and actions in reducing transmission and geographic spread of disease, and
3. Engage and communicate effectively with Department staff, stakeholders, other partners, the public, and the media in a timely, meaningful, and efficient manner.

Strategies to meet these Management Level II goals include the following:

MINIMIZE GEOGRAPHIC SPREAD OF DISEASE AND REDUCE DISEASE TRANSMISSION

1. Change current private land deer population objectives to less than or equal to 2.8 antlered deer harvested per square mile of habitat
2. Assess county-level harvest data, CWD monitoring data, private land deer population status, and deer population objectives annually
    a. If the private land deer population status does not match the deer population objective, increase antlerless harvest the following deer hunting season by initiating new or additional harvest strategies. Examples include, but are not limited to, the following:
        a. Full-season either-sex every season
        b. 1:1 earn-a-buck
        b. 2:1 earn-a-buck
        c. Extended general firearms season
            1. 7-week general firearms season
            2. September antlerless season
            3. January – end of March antlerless season
3. Continue or consider the creation of a Disease Focus Zone(s) for isolated detections located more than 5 miles from the nearest CWD detection
4. Restrict carcass transport to other DMA counties
5. Continue prohibition on antler point restrictions
6. Encourage hunters to double-bag leftover carcass parts and dispose in a landfill

MONITOR APPARENT PREVALENCE AND SPATIAL DISTRIBUTION OF DISEASE OR DETECT DISEASE AT LOW APPARENT PREVALENCE

1. Continue year-round passive surveillance by investigating clinical suspect reports from the public until at least two clinical suspects have been confirmed from the county
2. Conduct annual enhanced monitoring
3. Consider initiation or continuation of enhanced surveillance in counties adjacent to the DMA
4. Evaluate apparent prevalence in a 5- and 10-mile radius area around the trigger detection and/or in any other area where endemic status is suspected
5. If no additional CWD detections are confirmed in a DMA after 3 years of consecutive enhanced monitoring, consider discontinuation or reduction of monitoring efforts and dissolution of the DMA
6. If no additional CWD detections are confirmed in a DMA after 5 years of consecutive enhanced monitoring, dissolve the DMA

EVALUATE MANAGEMENT STRATEGIES AND ACTIONS FOR EFFECTIVENESS IN REDUCING TRANSMISSION AND GEOGRAPHIC SPREAD OF DISEASE

1. Collaborate with notable CWD researchers to develop potential new harvest strategies that may influence apparent prevalence trends and geographic spread
2. Collaborate with notable CWD researchers to develop models to assess the effect of a management strategy or action on apparent prevalence trends or geographic spread

ENGAGE AND COMMUNICATE EFFECTIVELY WITH DWR STAFF, STAKEHOLDERS, PARTNERS, PUBLIC, AND THE MEDIA

1. Refer to the 2020 – 2024 DWR CWD Detection Notification Plan

NON-DMA COUNTIES

A county will be classified as a **Non-DMA County** if the following conditions have been met:

1. County is not included in a DMA

Goals to be accomplished in a Non-DMA County include the following:

1. Minimize the risk of disease introduction,
2. Detect disease at low apparent prevalence,
3. Manage deer populations to balance cultural carrying capacity (CCC), requirements of the local ecosystem, and health of the herd, and
4. Engage and communicate effectively with Department staff, stakeholders, other partners, the public, and the media in a timely, meaningful, and efficient manner.

Strategies or best management practices (BMP) to meet these Management Level II goals:

STRATEGIES TO MINIMIZE RISK OF DISEASE INTRODUCTION

1. Encourage hunters harvesting deer from non-DMA counties to avoid long-distance transportation of whole deer carcasses
2. Encourage hunters harvesting deer from non-DMA counties to dispose of leftover carcass parts in landfills

STRATEGIES TO DETECT DISEASE AT LOW APPARENT PREVALENCE

1. Continue year-round passive surveillance by investigating clinical suspect reports
2. Conduct a county-based risk assessment to generate hazard scores
    a. Using the hazard scores, determine the risk level for each non-DMA county
3. Optimize CWD surveillance efforts by utilizing a risk-based weighted surveillance strategy based on the results of the county-based risk assessment

BMPS TO MANAGE DEER POPULATIONS FOR CCC, ECOSYSTEM REQUIREMENTS, AND HEALTH OF THE HERD

1. Enact statewide, year-round, cervid feeding ban
2. Eliminate fawn rehabilitation
    a. Alternative but less preferred option: Review current fawn rehabilitation program/permit conditions to ensure disease transmission risk is as low as possible
3. Adjust harvest regulations or seasons to meet population objectives in deer management plan
4. Remove antler point restrictions in all counties or areas where they currently exist
5. Do not initiate antler point restrictions in new counties or areas
6. Maintain prohibition on captive cervid facilities and importation of non-permitted cervids
7. Maintain prohibition on hunting over bait

STRATEGIES TO ENGAGE AND COMMUNICATE EFFECTIVELY WITH DWR STAFF, STAKEHOLDERS, PARTNERS, PUBLIC, AND MEDIA

1. Refer to the 2020 – 2024 DWR CWD Detection Notification Plan

CWD Prevention, Surveillance, and Management in Captive Cervid Facilities and Hunting Enclosures

Goals of CWD prevention, surveillance, and management of captive cervid facilities and hunting enclosures include the following:

1. Detect disease as early as possible,
2. Minimize introduction of CWD into a captive cervid facilty,
3. Minimize contact between free-ranging and captive cervids,
4. Eradicate CWD from captive herd, and
5. Follow the guidance provided in the Trigger Section above to respond to a CWD detection in a captive cervid facility or hunting enclosure.

Strategies to meet these initial response goals include the following:

Detect Disease as Early as Possible

- Captive cervids over 6 months of age that die for any reason other than intentional culling: Submit head for CWD testing
    - Examples: animal found dead on exhibit, animal humanely dispatched due to illness or injury, etc.
    - Notify DWR or a Virginia Department of Agriculture and Consumer Services laboratory within 48 hours of death to coordinate sample submission
- Captive elk, white-tailed deer, and sika deer that are intentionally culled: Submit heads of all animals greater than 6 months of age
- Captive fallow deer, axis deer, muntjac, Pere David deer, tufted deer, and eld's deer that are intentionally culled: Submit heads of 10% (no more than 20 total) of total
    - Example: 10% (no more than 20 total) of culled fallow deer, 10% (not more than 20 total) of culled axis deer, etc.
- Require all captive cervid owners and enclosure operators to inform DWR staff of any animals showing clinical signs consistent with CWD
    - Significant weight loss or poor body condition in combination and concurrent neurological abnormalities
- Require submission of all non-hunting mortalities that occur in a registered hunting enclosure to DWR staff for CWD testing
- Require owners of hunting enclosures to submit heads from at least five adult deer harvested (or all heads, if less than 5 deer in total are harvested) each hunting season within the enclosure to their local district biologist for disease testing
- Require an annual cervid inventory and fence line inspection of all captive cervid facilities
- Perform an annual review of inspection records and data (i.e., CWD testing submissions, tags, import/export/transfers, etc.) and reconcile the CWD database with the captive cervid database for each individual facility or enclosure

Minimize Introduction of CWD into a Captive Cervid Facility

- DWR staff to humanely dispatch and collect CWD samples from any wild white-tailed deer that is found in a captive cervid facility
- DWR staff to humanely dispatch illegally imported and/or possessed cervids

MINIMIZE CONTACT BETWEEN FREE-RANGING AND CAPTIVE CERVIDS

- Humanely dispatch and test any captive cervids that escape from a captive facility that cannot be retrieved by the owner within 72 hours
- Require annual fence line inspection of all registered and active enclosures, registered but inactive enclosures, and unregistered enclosures.
- Maintain follow-up surveillance or periodically audit of formerly registered hunting enclosures
- Develop fence line recommendations for captive cervid facilities
- Consider construction of an exterior fence if CWD is detected in a captive cervid or if CWD is detected in a wild cervid within 5 miles of a captive cervid facility
    - Costs associated with fencing improvements will be the responsibility of the owner of the captive deer facility

ERADICATE CWD TRANSMISSION WITHIN THE CERVID HERD

- Depopulate all captive cervids at the facility under applicable statutory and regulatory authority provided by emergency regulations and if federal or state funds are available for indemnification or the cervid facility owner volunteers to depopulate in the absence of indemnification
    - Decontaminate the facility to the maximum extent possible following the USDA-APHIS guidelines
        - Costs associated with decontamination will be the responsibility of the owner of the captive deer facility
    - Prohibit re-population of facility with any species of cervid
- Conduct trace-back and trace-forward epidemiological investigations to determine potential exposure(s) between the known positive cervid and other susceptible cervids
    - Trace-forward herds – Remove and test exposed animal(s) if indemnity available or owner volunteers
        - Consider the entire herd positive if an exposed animal is positive
        - Continue routine surveillance (test of death losses over twelve months of age) for 60 months if an exposed animal is negative
    - Trace-back herds
        - Quarantine herd for 60 months from the last case traced back to herd
        - Conduct herd surveillance during quarantine
- Develop a herd plan, which also includes a premises plan, if indemnity funds are not available and the captive cervid facility owner does not voluntarily depopulate
    - Herd/premises plan shall include cleaning and disinfecting procedures, future import and export of captive cervids from the facility, provision of and maintenance of fencing to prohibit access by wild cervids, and the time period for and testing requirements of surveillance
    - Quarantine the facility for a minimum of five years

LITERATURE CITED

Angers, R. C., T. S. Seward, D. et al. 2009. Chronic wasting disease prions in elk antler velvet. Emerging Infectious Diseases 15: 696-703.

Blanchong, J. A., D. O. Joly, M. D. Samuel, et al. 2006. White-tailed deer harvest from the chronic wasting disease eradication zone in south-central Wisconsin. Wildlife Society Bulletin 34: 725-731.

Connor, M. M., M. W. Miller, M. R. Ebinger, and K. P. Burnham. 2007. A meta-baci approach for evaluating management intervention on chronic wasting disease in mule deer. Ecological Applications 17: 140-153.

Czub, S. 2017. First evidence of intracranial and peroral transmission of chronic wasting disease (CWD) in Cynomolgus macaques: A work in progress. Prion Conference presentation, Edinburgh, Scotland (5/25/2017). https://www.youtube.com/watch?v=Vtt1kAVDhDQ

DeVivo, M., D. R. Edmunds, M. J. Kauffman, et al. 2017. Endemic chronic wasting disease causes mule deer population decline in Wyoming. PLoS ONE 12: e0186512. https://doi.org/10.1371/journal. pone.0186512

Edmunds, D. R., M. J. Kauffman, B. A. Schumaker, et al. 2016. Chronic wasting disease drives population decline of white-tailed deer. PLoS ONE 11: e0161127. doi:10.1371/journal.pone.0161127

Gillin, C. M., M. Colin, and J. R. Mawdsley (eds.). 2018. AFWA technical report on best management practices for surveillance, management and control of chronic wasting disease. Association of Fish and Wildlife Agencies, Washington D.C. 111 pp.

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

Gross, J. E., and M. W. Miller. 2001. Chronic wasting disease in mule deer: disease dynamics and control. Journal of Wildlife Management 65: 205-215.

Haley, N. J., D. M. Seelig, M. D. Zabel, et al. 2009. Detection of CWD prions in urine and saliva of deer by transgenic mouse bioassay. PLoS One 4: e4848.

Henderson, D. M., N. D. Denkers, C. E. Hoover, et al. 2015. Longitudinal detection of prion shedding in saliva and urine by chronic wasting disease-infected deer by real-time quaking-induced conversion. Journal of Virology 89: 9338-9347.

Hoover, C. E., K. A. Davenport, D. M. Henderson, et al. 2017. Pathways of prion spread during early chronic wasting disease in deer. Journal of Virology 91: e00077-17. https://doi.org/10.1128/ JVI.00077-17.

Jennelle, C. S., V. Henaux, G. Wasserberg, et al. 2014. Transmission of chronic wasting disease in Wisconsin white-tailed deer: implications for disease spread and management. PLoS ONE 9: e91043. doi:10.1371/journal.pone.0091043

Kurt, T. D., L. Jiang, N. Fernandez-Borges, et al. 2015. Human prion protein sequence elements impede cross-species chronic wasting disease transmission. Journal of Clinical Investigations 125: 1485-1496.

Mateus-Pinilla, N. H-Y Weng, M. O. Ruiz, et al. 2013. Evaluation of a wild white-tailed deer population management program for controlling chronic wasting disease in Illinois, 2003 – 3008. Preventative Veterinary Medicine 110: 541-548.

Mathiason, C. K., J. G. Powers, S. J. Dames, et al. 2006. Infectious prions in the saliva and blood of deer with chronic wasting disease. Science 314: 133-136.

Mathiason, C. K., S. A. Hays, J. Powers, et al. 2009. Infectious prions in pre-clinical deer and transmission of chronic wasting disease solely by environmental exposure. PLoS ONE 4: e5916. doi:10.1371/journal.pone.0005916.

MaWhinney, S., W. J. Pope, F. E. Forster, et al. 2006. Human prion disease and relative risk associated with chronic wasting disease. Emerging Infectious Diseases 12: 1527-1535.

Miller, M. W., and J. R. Fischer. 2016. The first five (or more) decades of chronic wasting disease: lessons for the five decades to come. Transactions of the North American Wildlife and Natural Resources Conference 81. cpw.state.co.us/Documents/Research/CWD/Miller-Fischer_ CWDlessons.pdf.

Miller, M. W., and E. S. Williams. 2003. Horizontal prion transmission in mule deer. Nature 425: 35-36.

Miller, M. W., E. S. Williams, N. Thompson Hobbs, and L. L. Wolfe. 2004. Environmental sources of prion transmission in mule deer. Emerging Infectious Diseases. 10: 1003-1006.

Miller, M. W., N. T. Hobbs, and S. J. Tavener. 2006. Dynamics of prion disease transmission in mule deer. Ecological Applications 16: 2208-2214.

Nalls, A. V., E. McNulty, J. Powers, et al. 2013. Mother to offspring transmission of chronic wasting disease in Reeves' Muntjac deer. PLoS ONE 8: e71844

Potapov, A. E. Merrill, M. Pybus, and M. A. Lewis. 2016. Chronic wasting disease: transmission mechanisms and the possibility of harvest management. PLoS ONE 11: e0151039. doi:10.1371/journal.pone.0151039

Pritzkow, S., R. Morales, F. Moda, et al. 2015. Grass plants bind, retain, uptake, and transport infectious prions. Cell Reports 11: 1168-1175.

Prusiner, S. B. 1982. Novel proteinaceous infectious particles cause scrapie. Science 216: 136-144.

Race, B., K. D. Meade-White, Katie Phillips, et al. 2014. Chronic wasting disease agents in nonhuman primates. Emerging Infectious Diseases 20: 833-837.

Race, B., K. Williams, C. D. Orru, et al. 2018. Lack of transmission of chronic wasting disease to cynomolgus macaques. 2018. Journal of Virology 92: e005510-18.

Raymond GJ, Hope J, Kocisko DA, Priola SA, Raymond LD, Bossers A, et al. 1997. Molecular assessment of the potential transmissibilities of BSE and scrapie to humans. Nature 388:285–8. 12.

Raymond GJ, Bossers A, Raymond LD, O'Rourke KI, McHolland LE, Bryant PK III, et al. 2000. Evidence of a molecular barrier limiting susceptibility of humans, cattle and sheep to chronic wasting disease. EMBO Journal 19:4425–30.

Safar, J. G., P. Lessard, G. Tamgüney, et al. 2008. Transmission and detection of prions in feces. Journal of Infectious Diseases 198: 81-89.

Saunders, S. E., Bartelt-Hunt, S. L. & Bartz, J. C. (2012). Occurrence, transmission, and zoonotic potential of chronic wasting disease. Emerging Infectious Diseases 18, 369–376.

Saunders, S. E., S. L. Bartelt-Hunt, and J. C. Bartz. 2008. Prions in the environment. Prion 2: 162-169.

Schauber E. M. and A. Woolf. 2003. Chronic wasting disease in deer and elk: a critique of current models and their application. Wildlife Society Bulletin 31: 610-616. doi:http://www.jstor.org/stable/3784580.

Selariu, A., J. G. Powers, A. Nalls, et al. 2015. In utero transmission and tissue distribution of chronic wasiting disease-associated prions in free-ranging Rocky Mountain elk. Journal of General Virology 96: 3444-3455.

Sigurdson, C. J., and A. Aguzzi. 2007. Chronic wasting disease. Biochimica et Biophysica Acta 1172: 610-618.

Tamgüney, G., M. W. Miller, L. L. Wolfe, et al. 2009. Asymptomatic deer excrete infectious prions in feces. Nature 461: 529-532.

Uehlinger, F. D., A. C. Johnston, T. K. Bollinger, and C. L. Waldner. 2016. Systematic review of management strategies to control chronic wasting disease in wild deer populations in North America. BMC Veterinary Research 12: 173. DOI 10.1186/s12917-016-0804-7

Waddell, L, J. Greig, M. Mascarenhas, et al. 2016. Current evidence on the transmissibility of chronic wasting disease prions to humans – a systematic review. Transboundary Emerging Diseases DOI: 10.1111/tbed.12612

Wasserberg, G., E. E. Osnas, R. E. Rolley, and M. D. Samuel. 2009. Host culling as an adaptive management tool for chronic wasting disease in white-tailed deer: a modelling study. Journal of Applied Ecology. 46: 457-466.

Western Association of Fish and Wildlife Agencies. 2017. Recommendations for adaptive management of chronic wasting disease in the West. WAFWA Wildlife Health Committee and Mule Deer Working Group. Edmonton, Alberta, Canada and Fort Collins, Colorado, USA.

Williams, E.S. 2005. Chronic wasting disease. Veterinary Pathology 42:530-549.

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

Williams, E. S., and M. W. Miller. 2002 Chronic wasting disease in deer and elk in North America. Scientific and Technical Review of the Office International des Epizooties 21:305-316.

Williams, E. S., M. W. Miller, T. J, Kreeger, et al. 2002. Chronic wasting disease of deer and elk: a review with recommendations for management. Journal of Wildlife Management. 66: 551-563.

APPENDIX A. GLOSSARY OF TERMS

Adaptive management: A systematic approach for improving resource management activities and policies by learning from alternative management approaches. A concept whereby one learns from experience and modifies subsequent behavior in light of that experience.

Antler point restrictions (APR): A harvest strategy intended to increase the number of older bucks on the landscape. In Virginia counties with APRs in effect, if a deer hunter kills two antlered bucks in a license year, at least one of the bucks must have at least four antler points, one inch or longer, on one side of the antlers.

Apparent prevalence: The proportion of confirmed CWD-positive cervids from a total sample of cervids tested in a specific area and time frame.

Baseline monitoring: A strategy to track CWD prevalence trends and geographic spread utilizing voluntary CWD testing at head drop site(s), at minimum. Expected annual sample total is 150 deer or less per county.

Clinical suspect: A cervid that exhibits clinical signs consistent with CWD infection. Although clinical signs of CWD infection are non-specific, they typically include significant weight loss in combination with neurologic impairment.

CWD-positive county: A county that has confirmed the death of a CWD-positive cervid within its borders.

Disease Focus Zone (DFZ): Special either-sex hunting opportunities focused in an approximately 3-mile radius around an outlier CWD detection, which are located more than 5 miles from the nearest detection. Harvested deer may or may not be required to be submitted for testing.

Disease Management Area (DMA): Any county or clearly demarcated portion of a county within 10 miles of a trigger or border detection. Comprised of Management Level I and/or Management Level II counties. The purpose of a DMA is to limit disease transmission and spread across the landscape by prohibiting carcass movements and fawn rehabilitation, reducing deer densities, etc.

1:1 earn a buck (EAB): A harvest strategy intended to increase the harvest of antlerless deer and reduce deer populations. Within a license year and within each individual 1:1 EAB county, a hunter must have taken at least one antlerless deer on private lands in that county before taking a second antlered deer on private lands in that county. In 1:1 EAB counties located east of the Blue Ridge Mountains, where it is legal to harvest a third antlered deer, a hunter must have taken at least two antlerless deer on private lands in that county before taking a third antlered deer on private lands in that county.

2:1 earn a buck (EAB): A harvest strategy intended to increase the harvest of antlerless deer and reduce deer populations. Within a license year and within each individual 2:1 EAB county, a hunter must have taken at least two antlerless deer on private lands in that county before taking a second antlered deer on private lands in that county.

Endemic: An endemic area has a reported apparent prevalence of 5% or higher in a 5- or 10-mile radius area around a detection. An endemic county either has a reported county-level apparent prevalence greater than 2% or exhibits extensive spatial distribution of CWD throughout the county, regardless of county-level and 5- or 10-mile radius apparent prevalence estimates.

Enzyme-Linked Immunosorbent Assay (ELISA): Used as a CWD screening test in cervids.

Enhanced monitoring: A strategy to track CWD prevalence trends and geographic spread. Annual sample goal of enhanced monitoring is greater than 150 deer and may be achieved utilizing voluntary CWD testing head drop site(s) supplemented by mandatory CWD testing day(s), road-kill collection, processor and taxidermist support, kill-permit deer testing, and/or other novel sample collection methods.

Enhanced surveillance: Annual target goals in a non-DMA county that exceed target goals developed using a weighted surveillance strategy. Supplementary sample collection methods include voluntary CWD testing at head drop site(s), road-kill collection, processor support, expanded taxidermist support, and/or other novel surveillance methods.

Hazard score: Estimates the magnitude of the hazards that present risk of CWD prion introduction into the local wild white-tailed deer population. A hazard score is calculated via a risk assessment.

Immunohistochemistry (IHC): Used as a confirmatory test for CWD infection in a cervid.

In-season preliminary monitoring: A harvest-based monitoring effort initiated during the deer season that uses local processors, direct coordination with local landowners and hunters, voluntary CWD testing head collection sites, etc. to estimate apparent prevalence.

Laboratory confirmed CWD-positive: A cervid that has tested positive for CWD via immunohistochemistry. For trigger and border detections, the IHC results must be returned from the National Veterinary Services Laboratory before a sample can be considered confirmed. For non-trigger or border detections, the IHC results may be returned from any USDA-approved laboratory.

Local DWR CWD Management Team: Wildlife Veterinarian, local Regional Manager, Forest Program Manager, Deer Project Leader, Deer-Bear-Turkey Biologist, local District Biologist(s), Wildlife Disease Biologist, regional Lands and Access Manager, local Law Enforcement staff.

Post-season preliminary monitoring: A monitoring effort initiated after the deer season has closed that utilizes kill permit deer, a special late CWD management season, road-kill, etc. to estimate apparent prevalence.

Risk assessment: Determines the existence and the magnitude of hazards that present risk of CWD prion introduction into the local wild white-tailed deer population. Generates a hazard score.

Weighted surveillance strategy: A surveillance strategy designed to detect new disease foci in non-detect counties by focusing resources in areas determined to be highest risk for CWD introduction based upon the results of a risk assessment.