

Chronic Wasting Disease Workshop

Co-hosted by
Alberta Sustainable Resource Development, Fish and Wildlife Division
and Saskatchewan Ministry of Environment, Fish and Wildlife Branch

Preamble

This document represents the collective experience and wisdom of the people who attended the chronic wasting disease (CWD) Workshop held in Edmonton, Alberta on August 8 and 9, 2008. The final product is intended to provide information to guide wildlife agency response plans and interjurisdictional consistency. Information herein is not binding on any individual participant nor their agency. The document is written in relatively plain language in order to serve a wide general audience.

The goal of the CWD workshop was to provide an overview of wildlife agency programs designed and delivered in response to findings of CWD in wild cervids in different jurisdictions in Canada and USA. The approach was to examine representative current programs, their successes and failures, and use the information, in conjunction with participant experiences, to offer some collective recommendations for future CWD response plans and programs. Workshop presenters focused on the approach to CWD response in their jurisdiction. This set the stage for breakout groups to enter into detailed discussion of the merits of various wildlife agency response activities and their applicability in three CWD risk scenarios: enzootic, newly detected, and at risk (not detected).

Definitions

Enzootic: an area or locale in which CWD has established ongoing transmission.

Newly Detected: an area or locale in which reasonable ongoing surveillance for CWD has been undertaken and a limited number of cases have been detected.

At Risk: an area in which ongoing surveillance has not detected cases of CWD or in which there are no identifiable risk factors for CWD occurrence.

Report Process: Workshop facilitators reviewed the meeting notes and flip charts as the basis of a draft report. To accommodate review and comments from the workshop participants, the structure of the draft reflected the agenda of the workshop (Appendix 1: Workshop Agenda). Any significant information not captured in the draft, any misrepresentation of either the oral presentations or the breakout discussions, or any major concerns were noted during review by the participants. Any and all comments were welcomed regarding the first draft. Based on participant input and indication that the report was a reasonable reflection of the workshop discussions, a final document was generated. Workshop participants then had a final opportunity to clarify items in the final draft but not add or make substantial further changes.

This report was compiled by Margo Pybus (Alberta Sustainable Resource Development, Fish and Wildlife Division) and Yeen Ten Hwang (Saskatchewan Ministry of Environment).

Executive summary

Chronic wasting disease (CWD) is a fatal brain disease documented in farmed and wild cervids. It belongs to a group of diseases known as transmissible spongiform encephalopathies (TSEs). CWD is largely restricted to North America; it was first described in 1977/78 in captive mule deer in Colorado and retroactively identified in the same research facility as early as the late 1960s. It was first detected in the wild in 1981 in free-ranging elk in Colorado. Currently, CWD has been diagnosed in 15 US states, two Canadian provinces, and South Korea (farmed elk imported from Canada). CWD has caused significant economic impacts on the recreational hunting and game farm activities, and has resulted in major public investment by wildlife and agricultural agencies in the affected jurisdictions.

Information for this report was gathered throughout a 1½ day workshop co-hosted by the Fish and Wildlife Division of Alberta Sustainable Resource Development and the Fish and Wildlife Branch of Saskatchewan Ministry of Environment on August 8 & 9, 2008. Workshop participants included wildlife and livestock disease specialists, managers, researchers, and policy specialists from state/provincial and federal agencies and universities across Canada and the United States. This report represents the collective experience and wisdom of the participants in their respective jurisdiction and expertise on disease management. Information provided herein is not binding on any individual participant or agency. This document is intended to be a resource to help inform wildlife agency response programs and interjurisdictional consistency. The document is written in relatively plain language to serve a general audience.

The objective of the workshop was to identify the range of CWD response programs and risk assessment strategies used by wildlife agencies in North America. The programs and strategies were stratified by three risk categories with regards to CWD: enzootic, newly detected, and at risk areas. The assembled information, in conjunction with the collective experiences of workshop participants, was used to offer guidelines for wildlife agencies to consider when developing CWD management strategies.

The goal of the workshop was to provide an overview of wildlife CWD response programs in different jurisdictions in Canada and USA and to discuss the merits and applicability of the programs in three CWD risk scenarios: enzootic, newly detected, and at risk (not detected). The approach was to first examine representative current programs and their successes and failures through structured powerpoint presentations. The workshop approach then shifted into a problem solving format with all participants divided into smaller groups for discussion of assigned topics. Each group reported back to the combined assembly of all participants and provided flip-chart records of the group discussion. All participants provided comment and/or clarification on the group presentations. Concurrently, a facilitator captured notes of the ongoing presentations and discussions.

Overall, the response programs of most jurisdictions are influenced by the availability of financial resources, and most importantly, public and political support. The general consensus of the workshop is that prevention is the most effective goal in jurisdictions that are at risk of incurring CWD. Once CWD is detected in an area, it is difficult to eradicate; however, based on current information, timely and consistent response seems to be prudent. Current response activities in CWD enzootic areas include ongoing risk evaluation and hunter surveillance, as well as attempts to control the spread of the disease into new areas and new species. In newly detected areas, CWD management is best served by an aggressive targeting of infected individuals and reduction of risk factors. Ongoing surveillance and risk assessment also are very useful. In at risk areas, ongoing aggressive surveillance, particularly targeting clinical cases, as well as regional planning were considered most useful. With regards to disease epidemiology, essential elements included maintaining surveillance and documenting the spread of the disease, limiting cervid (live or dead) movement out of enzootic areas, limiting deer density in newly detected areas, and developing effective communication plans to inform the public and agency personnel and to reduce “message fatigue” over time in all risk categories.

Table of Contents:

CHRONIC WASTING DISEASE WORKSHOP: Final Report	
PREAMBLE.....	1
EXECUTIVE SUMMARY.....	2
SUMMARY TABLE OF CORE MANAGEMENT ELEMENTS TO ADDRESS CWD IN WILD POPULATIONS.....	
	5
A: NOTES FROM ORAL PRESENTATIONS (PRESENTATIONS APPENDED IN SECTION C.....	6
A-1. OVERVIEW OF CWD (CWD 102 FOR MANAGERS). BRYAN RICHARDS.....	6
A-2. RESPONSE PROGRAMS IN CWD ENZOOTIC AREAS:.....	7
A-2.1 Wisconsin (Julia Langenberg).....	7
A-2.2 Wyoming (Terry Kreeger).....	8
A-2.3 Nebraska (Bruce Trindle).....	9
A-3. RESPONSE PROGRAMS IN CWD NEWLY DETECTED AREAS:.....	10
A-3.1 West Virginia (Jim Crum).....	10
A-3.2 Kansas (Ruby Mosher).....	11
A-3.3 New York (NY rep unable to attend; spontaneous 5-min comment from the audience.....	12
A-3.4 Alberta (Margo Pybus).....	12
A-4. RESPONSE PROGRAMS IN CWD AT RISK AREAS:.....	13
A-4.1 Ontario (John Dungavell).....	13
A-4.2 Maryland (Cindy Driscoll).....	14
A-4.3 Manitoba (Richard Davis).....	15
A-5. RESPONSE PROGRAMS/CONTINGENCIES IN NATIONAL PARKS:.....	15
A-5.1 US Parks Service (enzootic) (Jenny Powers).....	15
A-5.2 Canada Parks Service (at risk) (Todd Shury).....	16
B. BREAKOUT SESSIONS.....	17
B-1. BREAKOUT SESSION I: POSSIBLE RESPONSE ELEMENTS.....	17
B-1.1 Should the wildlife agency response plan advocate eradication or control of CWD?.....	17
B-1.2 What aspects of the disease ecology of CWD can we control or manage in a CWD response plan?.....	18
B-1.3 What is the role of hunter harvest and how can it be delivered in a CWD control response plan?.....	19
B-1.4 What guidelines for carcass disposal, carcass movement, and disposition of 'orphan' fawns/calves are appropriate to control CWD?	20
B-1.5 What is the role of targeted local herd reduction and how can it be delivered in a CWD response plan?.....	22
B-1.6 What is the role of test/remove or novel interventions and how can they be delivered in a CWD response plan?.....	23
B-1.7 What is the role of manipulating deer movement and how can it be delivered in a CWD response plan?.....	24
B-1.8 What is the role of manipulating deer density and how can it be delivered in a CWD response plan?.....	24
B-1.9 How do management agencies gather and maintain public and/or political support for a CWD response plan?.....	25

B-2. BREAKOUT SESSION II - ASSESSING EFFICACY OF RESPONSES.....	27
B-2.1 Should the wildlife agency response plan advocate eradication or control of CWD?.....	27
B-2.2 What aspects of the disease ecology of CWD can we control or manage?.....	28
B-2.3 What is the role of hunter harvest and how can it be delivered?.....	29
B-2.4 What guidelines for carcass disposal, carcass movement, and orphan fawn/calf disposition?.....	30
B-2.5 What is the role of targeted local herd reduction and how can it be delivered?.....	31
B-2.6 What is the role of test/remove or novel interventions and how can they be delivered?.....	31
B-2.7 What is the role of manipulating deer movement and how can it be delivered? (covered off within other topics).....	32
B-2.8 What is the role of manipulating deer density and how can it be delivered? (in conjunction with group 5).....	32
B-2.9 How do management agencies gather and maintain public and/or political support?.....	33
C: ORAL PRESENTATIONS	33
C-1: Overview of CWD (CWD 102 for Managers) – B. Richards.....	
C-2: A brief review of what we've done and what we've learned – J. Langenberg.....	
C-3: Management of CWD in Wyoming – T. Kreeger.....	
C-4: Nebraska's CWD Management – B. Trindle.....	
C-5: West Virginia's CWD Management – J. Crum [not available]	
C-6: Kansas Response to CWD in Wild Cervids – R. Mosher.....	
C-7: Alberta's CWD Management – M. Pybus.....	
C-8: Ontario's Preparedness for CWD – J. Dungavell.....	
C-9: CWD Preparedness in Maryland – C. Driscoll.....	
C-10: Manitoba's CWD Preparedness Plan – R. Davis.....	
C-11: CWD Management in the US National Park Service – J. Powers.....	
C-12: CWD in Canadian National Parks? – T. Shury.....	
D: PARTICIPANT LIST.....	34
APPENDIX	
I: Workshop Agenda.....	36
II: Small Group Facilitator Notes.....	39
III: Tabular Summary of Workshop Results.....	40

List of Acronyms used in the Summary Report

APHIS – Animal and Plant Health Inspection Service (USDA)
 BSE – bovine spongiform encephalopathy
 CWD – chronic wasting disease
 DNR –Department of Natural Resources
 EHD/BTV – epizootic haemorrhagic disease / blue tongue virus
 NEPA - National Environmental Policy Act (US)
 NPS - National Parks Service (US)
 SRM - Specific Risk Material
 TSE - transmissible spongiform encephalopathies
 USDA – US Department of Agriculture
 vCJD – variant Creutzfeldt-Jakob disease

<i>Summary of Core Management Elements to Address CWD in Wild Populations</i>			
	Enzootic	Newly Detected	At Risk
Q1. Eradication or control?			
Eradication	∅	∅	NA
Control	+	+++	NA
Risk Assessment	+++	+++	+++
Surveillance	+	+++	+++
Q2. Manageable disease ecology?			
Reduce deer numbers/density	+	+++	++
Reduce environmental contamination	++	+	NA
Manage deer movements & concentrations	++	+++	++
Q3. Role of hunters?			
Surveillance	+++	+	++
Clinical Suspect Removal	++	+	+++
Deer Population Reduction	++	+	+
Deer Age/Sex Structure Change	+	++	+
Focal Area Deer Removal	limited	limited	limited
Carcass Movement Biosecurity	+++	+	++
Baiting Restrictions	+++	+++	+
Removal of Escaped Farmed Cervids	+	+	+
Q4a. Carcass disposal restrictions	++	+++	+
Q4b. Carcass movement restrictions	++	++	++
Q4c. Orphan fawn/calf restrictions	+	+++	+
Q5. Role of targeted herd reduction?	+	+++	++
Q6. Role of novel interventions?	+?	+++	NA
Q7. [[withdrawn]]			
Q8. Role of manipulating deer density?	(∅ to ++)	+++	+
Q9. How to maintain support?	++	+++	+++

Key: ∅ not useful; + somewhat useful; ++ useful; +++ very useful; NA not applicable

A: Notes from oral presentations (actual presentations - see Section C)

A-1. Overview of CWD (CWD 102 for Managers). Bryan Richards

Rather than review CWD basics (CWD 101), this presentation focuses on recent evidence and remaining gaps relating to management of the disease in wild cervids.

- Overall, two salient needs to improve CWD management: improved detection surveillance & better monitoring of existing outbreaks
- Brief overview of prion disease management:
 - Kuru – ceasing a behaviour stopped the disease
 - BSE – effective management by halting transmission
 - Scrapie – US program to eradicate by 2010
 - CWD in US captive facilities - ~80 captive facilities – last new US captive herd was in 2006.
 - CWD in free-ranging North American. herds – managing is extremely difficult
- Recent articles:
 - Environmental sources of prion transmission in mule deer (Miller et al)
 - Infectious prions in saliva and blood of deer with CWD (Mathiason et al)
 - Transmission and detection of prions in feces (Safar et al)
 - Prions adhere to soil minerals and remain infectious (Johnson et al)
 - Infectious agent of sheep scrapie may persist in the environment for at least 16 years (Georgsson et al)
 - Oral transmissibility of prion disease is enhanced by binding to soil particles (Johnson et al)
 - Chronic wasting disease in mule deer: Disease dynamics and control (Gross et al)
- Is CWD really a problem? (Public: doesn't affect people or cattle so not too concerned) but ...
 - Contaminated environment
 - Potential for transmission to other cervids
 - No evidence of disease reaching equilibrium in affected populations
 - No strong evidence of management success
 - Disease dynamics very different between farmed and free-ranging cervids.
- **Management: If you don't have it, do everything you can to prevent getting it! If that fails, options are basically manage or monitor spread**
 - Establish management goals, implement them, monitor results, support research
- Where does CWD come from? ...Walks in or trucked in (+ scavengers spread??)
- Preventative measures: 3 escalating components
 - Limit introduction risks
 - Limit establishment/amplification risks
 - Mitigate established risks
- Management goals:
 - Passive: monitor distribution and prevalence [basically, watch it spread]
 - Active: slow the spread, contain/control the spread, eliminate sparks, control prevalence, reduce potential environmental contamination & subsequent disease
 - Actions: movement restrictions, carcass movement restrictions, selective removal of CWD positive animals, use predators for removal(?), population reduction (kill individuals to keep the population healthy)
- Specific goals:
 - Reduce # of CWD infected deer
 - Reduce environmental contamination

- Reduce # of potential cases
- Reduce disease transmission
- Hunters: do not view themselves as disease control agents; will avoid high prevalence herds.
- Examples:
 - Illinois: extended hunting not very effective; sharpshooting reasonably successful due to geography (corn fields and pockets of habitat); also saw decline in road kills (implies reduced deer population).
 - Alberta: used helicopters; 200/day/sharpshooter; very efficient & effective
- Need to inform all audiences of realistic timeline for management, 5 years is NOT long enough
- Need true management experiments; not mini-management
- Must establish ongoing monitoring; but how to detect changes in disease prevalence?? Particularly in situations of very low prevalence
- Is prevalence the correct measure? NO. Need to find other metrics that better describe the disease and the effects of management actions.
- Effective communications: Wisconsin example.
- Regional aspects of disease management; AB/SK, WI/IL.
- Need alternate mechanisms for delivering/achieving population reduction
- Explore alternative means for disease control

A-2. Response Programs in CWD **Enzootic Areas**:

A-2.1 Wisconsin (*Julia Langenberg*)

A brief review of what we've done and what we've learned

- Original general goals: limit spread, eradicate in known infected areas, expand surveillance (wild and captive), increase scientific knowledge
- 2% prevalence in first assessment sample (30 of 1700 deer); overall prevalence in affected areas now estimated to average ~4-5%
- Started with large-scale control effort attempting significant deer population reduction. Mobilized hunter effort was the primary strategy:
 - Challenges: essentially all CWD-affected land is private land; very high deer densities; hunters traditionally can remove about 1/3 of the deer population annually, but can they do more?

Tools used:

- STICK - 'Earn a buck' – learned that WI hunters will consistently take the same # of bucks, but need regulation to get them to take antler-less first (increases mortality of fawns & females, and thus overall mortality and recruitment). But is there a downside since higher CWD prevalence in males?
- CARROT - \$400 reward for infected deer (money split by hunter and landowner); Based on survey data and harvest numbers, this had little effect in increasing harvest. Maybe not enough money?
- CARROT – Wisconsin DNR subsidized venison pantry donations and CWD testing; popular program with hunters; very few extra deer taken so does not contribute greatly to reducing deer pops.

Also used government agency sharpshooters to augment hunter effort in areas lightly hunted, high prevalence areas, CWD hotspots on the periphery. Sharpshooters effective: remove more antlerless deer than hunters, remove more positive deer.

- Variety of challenges in using these tools. For example, disposal of carcasses: landfilling is the

best option (lots of good research evidence and support); law passed to WI can indemnify landfills and wastewater operations if there was a proven risk, BUT still only 1 landfill will take deer in the CWD zone and Wisconsin DNR is spending thousands of dollars disposing of tested deer, butcher waste, and some culled deer.

- CWD control is not just removing deer: WI also worked on restricting deer feeding/baiting (banned in CWD zones, restricted in rest of state). Also enhanced monitoring and management of CWD in farmed cervids (500-600 farms, lots of them white-tail farms)
- Progress in controlling CWD to date in WI?:
 - no significant overall change in deer populations in CWD zone, but perhaps some evidence for a decrease in first years with intensive management but lost ground with diminished efforts in more recent years (due to push-back from hunters). CWD fatigue sets in with hunters, landowners, and managers.
- No obvious trend in disease prevalence. Given expected increase in prevalence, is this good news? Does this suggest control efforts are having some effect??? Would expect it to take longer than 3-5 years to see effects of disease management; but longer timeframe not necessarily acceptable to politicians.

Summary:

- Key Lessons
 - WI hunters unwilling to harvest enough deer for significant pop. reduction
 - High program costs (\$4-6 million/yr)
 - Difficult to detect & monitor disease distribution and monitor prevalence, even with intense surveillance
- What's next for WI?
 - Currently rewriting state CWD management plan. Challenge: Hunters and landowners demand return to shorter seasons, yet they also want Wisconsin DNR to 'do something about CWD'.
 - Another attempt at state-wide ban on baiting and feeding? (to reduce risk for further spread of CWD and establishment of other diseases)
 - Searching for alternatives for removing deer; can we consider the highly controversial? introduce EHD? Snares? Toxicants?

A-2.2. Wyoming (Terry Kreeger)

The Good, The Bad and The Ugly

- WY probably had CWD for about 50 years
- Highly established and wide enzootic area (about 40% of the state)
- "One you have it, you're screwed" (Nettles, pers. comm.). There is no substitute for prevention.
- BSE-vCJD link gave new profile to CWD. No longer just a disease of wildlife – perceived threat to human health by general public (although no data to support this)
- No evidence that CWD is transmissible to humans or livestock.
- Need to know how CWD is transmitted if we are ever to develop an effective management tool.
- "CWD drives affected populations to extinction." – a management mantra from one theoretical model based on captive animal transmission rates. No evidence from free-ranging populations.
- WY did not do massive cull because disease was enzootic when found; no data to justify killing healthy, sentient animals to stop the disease; we are supposed to help not harm

- Response:
 - State-wide surveillance – slowly spreading disease
 - Eliminate CWD suspect animals in the wild
 - Carcass and live animal movement regulations
 - Carcass disposal regulations
 - Research, research, research
- Seeing slow, steady rise in prevalence (up to 45% in some wild deer herds with 3.6% increase per year)
- Can't confirm higher infection rates in bucks
- The Good:
 - Surveillance
 - Mini culls to eliminate new foci away from enzootic areas
 - Eliminate CWD from game ranches (note: WY has no game ranches)
 - Test hunter kill if asked
 - Ban artificial feeding by the public. Wyoming has elk feedgrounds in areas where there is no CWD.
 - Remove obviously infected animals
 - Carcass transport control
 - Research: transmission, vaccine/treatment (including human), population effects
- The Bad:
 - Environmental persistence
 - Carcasses can transmit CWD
 - Unknown transmission mechanisms
 - Genetic resistance
 - Migration of infected animals
- The Ugly:
 - Wide-scale culling
 - Game farms
 - Self-serving interests
 - Math models a crude representation of a highly complex biological system; they are useful if their limitations are understood.
- Predictions:
 - Will spread in the wild; be contained in game farms
 - Increased barriers to movement by states not wanting hunter-killed cervids brought back from CWD-infected areas.
 - Consistent demand by a subset of hunters for CWD diagnosis of their kills
- Need to apply critical thinking to disease management based on data.

A-2.3. Nebraska (Bruce Trindle)

Here's what we did and why we did it

- Surveillance of wild deer since 1997
- Used cull after first positive; 113 culled, 1 positive
- Depopulation at captive facilities testing positive proved difficult
 - Access to private property essential to managing CWD
 - Some deer pens are 1,500 acres
 - Public anxiety allowed prohibition of captive mule and white-tailed deer, and transportation

- of captive cervids
- Liberalized harvest in CWD control areas to reduce the population; found hunters were reluctant to kill diseased deer
- Liberalized harvest in other areas, found additional positives outside control areas; appeared to be eastern spread.
 - Redoubled our efforts – expanded control areas and with time saw increased hunter willingness to kill deer.
- Introduced new effort to control within Deer Management Units, rather than smaller control units; found positives farther east; culled 5 miles around new hotspots.
 - Needed permission from private property owners
 - Culling tied to road access, not getting a random sample
 - Culled largest hotspot (no trees, good access to deer);
 - Captured and collared deer; one deer moved 34 miles and returned; came into contact with CWD positive deer.
- New control areas created around new hotspots; increased antlerless harvest and general harvest within enzootic management units.
 - ‘Deer control areas’ renamed ‘Deer hunting opportunity areas’ – seems more palatable to hunters and public. Hunters did not want to be seen as disease control agents.
- Have seen a reduction in # of new positives even though sampling effort is the same. Did we get a reduction in disease or is this due to a bias in our sampling?
- Some apprehension towards testing by hunters killing in control areas.
- Commission did not communicate effectively to hunters; recently hunters wanted to go back to former management practices; Commission agreed; still get occasional sparks of CWD.
- Still culling to remove positives and to know prevalence. Culling not as easy as you think.
- Liberal deer seasons did not seem to control deer populations; killed more deer each year but pop increased anyway.

A-3. Response Programs in CWD Newly Detected Areas:

A-3.1 West Virginia (Jim Crum)

Lots of deer... and a little CWD

- 80% forested
- Dramatic (exponential?) deer density increase in recent decades
- Prior to detection: year-round surveillance of road kills (we got a LOT of road kills) as main method for several reasons;
- First positive in Hampshire County had no obvious signs of CWD; east of eastern continental divide; in a rain shadow; lots of private land; 88% of licenses are hunters from bordering states (prime area for deer).
- State already had broad plan as a result of UK’s foot and mouth disease outbreak; first positive did not trigger this plan so it fell to our DNR. We relied a lot on outside expert advice
- Goals:
 - Document distribution and prevalence
 - Communication and collaboration with neighbouring states
 - Develop management plan
- Changed sample population from whole state to close proximity to positives
- Used sharpshooting as extension of ongoing programs used for years for deer health assessment (ongoing program in many states in the southeast).

- Used adaptive cluster sampling
- 75% deer sampled were females
- Sampled lymph nodes at check stations
- Have applied zones around positives
- Web-based hunter access to test results, < 70% used
- No proven solutions to CWD
- Management options considered experimental
- Increased testing of captive cervids
- Ban feeding and baiting, lower deer density, lower deer age structure
- Politicians decided where these would be in place; rings around positives extend beyond these areas
- Survey showed generally reduced consumption of venison, hunting in CWD area??
- No indemnity

A-3.2 Kansas (Ruby Mosher)

A problem of 'twos'

- 2 states, 2 agencies, 2 responses
- CWD detected in both wild and captive cervids
- 2 states:
 - Kansas basically two different risk scenarios in one state
 - West: share enzootic border with CO and NE
 - East: at risk area. No cases despite good surveillance
 - 2 general Habitats
 - High plains/wheat fields, low deer density
 - Wooded hills and valleys, 16 x the deer density
- 2 agencies
 - Kansas Wildlife and Parks (wild), Kansas Animal Health Dept (captive)
 - Often do not communicate well with each other
- Initially 2 responses (Follow the money)
 - Import regs
 - After 1st case, voluntary CWD monitoring program
 - Depopulated infected captive herd
 - No changes for captive herds
- Response after the response was to talk about rewriting the contingency plan
 - Some concern that the response is deadlier than the (new) disease; make this an old disease ASAP and just leave it alone
- New response:
 - Educational seminar for field staff
 - Regional CWD public meetings
 - Public webpage, newsletters
 - Inter-agency bridge building with state ag, share concerns, share experiences wild vs. captive
- 2007 – resistance to Contingency Plan; need to be more inclusive
 - Important to have county governments on notification list; get to use landfills
 - Investigated abandoned elk farm that operated near the new detections in 2007
- Contingency plan
 - Not taken seriously by field staff or top officials
 - Calls for 300 samples for statistical validity (so if can't get 300, why get any)

- Culling and testing: Expensive, field staff not on board, not getting new cases.
- Stalemate
 - Restrictions on baiting and carcass movement restrictions
 - Hard to sell management actions not favoured by hunters.
 - Hard to sell management actions without neighbouring states
- Regulations
 - Documented breaks in state import regulations
 - 2/3 of captive facilities not monitored
 - Primary problem is lack of top down policy or concern in dealing with CWD
- What worked:
 - Grassroots team-building; cooperators, learning from mistakes; allowed more one on one work with counties; deer are important to local economies.
 - Town hall meetings to educate people and other members of your team; opportunity to listen to the public
 - Informal fence jumping between 2 agencies
 - Swiss cheese model of System Failure; if holes line up perfectly, system will fail despite all the other elements of the plan...

A-3.3 New York (NY rep unable to attend; spontaneous 5-min comment from the audience [Amy Dechen?])

- First positive case of CWD confirmed in 2002
- 6-year old WTD doe from a captive herd in Oneida County slaughtered as part of the state's mandatory surveillance and testing protocol
- Cull and test (hunter harvested and road kill)
 - [Additional information on NY web pages <http://www.dec.ny.gov/animals/7191.html>]

A-3.4 Alberta (Margo Pybus)

Combined ongoing aggressive program of hunter and government efforts

- 53 positive wild deer (48 mule deer, 5 white-tailed deer)
- 23% hunter-kill vs. 75% control kill
- Most cases are adult male mule deer
- CWD not part of native ecosystem; introduced fairly recently, no natural barriers to further spread in wild deer.
- Recommendation in 2004 Panel Report and in National CWD strategy: $<1 \text{ deer/km}^2$ of critical habitat to reduce transmission
- Alberta's Risk: spillover from SK; limited establishment in AB; import controls since 1988
- Control strategy:
 - Stamp out new foci
 - Limit spread from known areas
 - Primary tool population reduction in & around affected areas
- Goal: find and remove infected deer; limit further spread
 - Hunter component: maximize surveillance testing and hunter harvest

- Use targeted hunter harvest to generally reduce deer density in CWD areas
- Mandatory submission of hunter-killed deer in risk area
- Increased hunting season length
- Increased # of licenses
- Quota licenses in designated CWD risk areas
- Increased landowner opportunities
- 12 cases detected
- **Fish & Wildlife component:** enhance surveillance in high risk areas
 - Target winter control around new cases found in fall
 - 10 km targeted area around positive wild cases
 - Use a balance between agency culls and hunter harvest component
 - Focus on river courses (best deer habitat & potential travel corridor for deer and CWD)
- Enhanced surveillance in 2006
 - Looked at upstream watershed; found no positives
- Peer Review of Alberta Programs
 - Generally supportive
 - Saw strength in combined approach of hunters, landowners, stakeholders and government
 - Offered suggestions to improve programs; being looked at and implemented
 - Commended effort and approach by Alberta in dealing with CWD
 - Strong relationship with Agriculture
- Conclusions
 - Approach CWD aggressively
 - Use herd reduction and lower deer density in high risk areas to prevent further spread – interim tool until something better, such as vaccination or live animal test; use strategic response; be able to justify culls.
 - Primary goal: contain CWD to manageable areas

A-4. Response Programs in CWD At Risk Areas:

A-4.1 Ontario (John Dungavell)

CWD not wanted here

- ON has not detected CWD;
- White-tailed deer, elk, moose, caribou present
- Deer density 3-21/km²
- Surveillance since 2002
- Cases in mule deer from Colorado to Toronto Zoo in mid-1970s. Last zoo mortality in 1981
- 2004 Socio-economic study of detection of CWD
- Hunting: license revenue declines, Value added economic impacts
- Farming: Value added economic impacts, loss of income
- Ontario's Surveillance & Response Plan (look on the Web)
 - Addresses wild and captive
 - A high level plan, needs further work, particularly actions
 - Need high degree of public and stakeholder support
 - 3 Broad goals:
 - Preventing entry of CWD into Ontario

Early detection and effective response should there be an occurrence

Effective management and recovery following the response

Early public and stakeholder engagement essential to achieving each goal.

- If detected, eradicate CWD from Ontario's free-ranging and farmed cervid pops
- Schematic of response plan (look for it on the Web)
- Micro culls, hunter submissions, move to more sophisticated program
- Enhanced surveillance response zone 30 to 75 m zone
- Prevalence > 1%, strive for eradication
- Prevalence < 1%, strive for <2 deer /km
- Recovery: monitoring and surveillance
- Public and stakeholder engagement

A-4.2 Maryland (Cindy Driscoll)

CWD in adjacent state (West Virginia)

Our plans include two basic subsets of our overall CWD plan:

Phase I = No CWD detected [our current status]

Phase II = CWD detected.

- Phase I: Efforts to date for Phase 1
 - Restricted import, possession, and movement of cervids
 - Pursued legal action against non-permitted (illegal) deer farms
 - Tightened up enforcement on permitted deer farms
 - Sampled all counties annually
 - Conducted outreach/ updated web site regularly
 - Worked mostly within State of Maryland

Additional efforts for CWD detected within 50 miles of state border:

- Increased sampling in area adjacent to West Virginia where cases were found

- Phase II: IF CWD is detected in Maryland, we plan to:
 - Increase surveillance and sample collections
 - Establish a 5-mile radius around the positive to examine prevalence
 - Work closely with state partners, adjacent states, federal partners

On January 3, 2008 we were informed by the National Park Service (federal land) of a “weak positive” found at Catoctin Mountain Park (within state boundaries). It was a dry run for our CWD Response Plan

- Specifics: 6-mo old male fawn with neurologic signs. Weakly positive diagnosis by Colorado State Pathology lab
- Response:
 - State DNR staff met to determine response actions
 - An Action Plan developed to guide to track efforts
 - Hunter harvest sample collection conducted (a previously-scheduled hunt)
 - Road kill surveillance within the park
 - 2007 samples prioritized and sent to Southeast Cooperative Wildlife Disease labs.
 - Edited and updated outreach materials

January 17, 2008 USDA national veterinary services lab reported sample was negative.

- Lessons learned:
 - Keeps plans dynamic and flexible
 - Keep outreach materials updated
 - Work with adjoining states/ federal partners more closely

A-4.3 Manitoba (Richard Davis)

- Unable to attend but intended presentation is appended to this document.
 - Additional Manitoba information at

<http://www.gov.mb.ca/conservation/wildlife/disease/cwd.html>

A-5. Response Programs/Contingencies in National Parks:

A-5.1 US Parks Service (enzootic) (Jenny Powers)

Targeted direct response within policy limitations

- Major issue with park service; is CWD a natural or unnatural pathogen?
- Key – it spreads by a non-natural process
- 388 national parks in the US - One size fits all management doesn't work
- No hunting leads to high density of animals; surrounding areas have lower densities; fertile ground for disease amplification
- NPS [National Parks Service] has authority to manage wildlife only on federal lands
- NPS Directors Guidance (2002)
 - Targeted surveillance within 60 miles of known case
 - Movement restrictions
 - Coordinate and cooperate with adjacent states
 - Outreach
 - Environment compliance; National Environmental Policy Act (NEPA) – key element in CWD management
 - Delays action; allows removal of clinically ill animals; removal of healthy animals takes environmental assessment (1-10 yrs); takes a lot of planning; not as fluid as state plans.
- Four categories of parks:
 - Low risk – far from CWD regions
 - Mod – more than 60 miles from a case of CWD
 - High – within 60 miles of a case
 - Enzootic – two parks (Rocky Mtn in CO, Wind Cave in SD)
 - tonsillar biopsy test and cull strategies;
 - 5 years not long enough to evaluate management plan
 - Discussing whether to eradicate or not

A-5.2 Canada Parks Service (at risk) (Todd Shury)

Planning ahead of CWD

- 42 national parks
- CWD-free so far .. but coming uncomfortably close in SK and AB
- Three parks are 80 to 100 miles from known positive areas (Prince Albert and Grasslands in SK, Elk Island in AB)
- Guiding policy: “Maintain or restore ecological diversity characteristic of the natural region and likely to persist”
- Guidelines: Operate at an ecosystem level
- Human activities: does CWD threaten ecosystem integrity?
- Managing parks: minimal interference with natural processes; prevent serious alteration; actions based on scientific research
- CWD not considered a native part of Canadian ecosystems
- Passive surveillance: test road kills and opportunistic mortalities
- Significant concern regarding Elk Island –a source of translocated elk for various N. Am. conservation initiatives
- Developing a Parks Canada strategy to address CWD risks
 - Communications
 - Surveillance
 - Collaboration
 - Renew national strategy
 - Manage risk factors at a landscape level
- Major concerns
 - jurisdictional coordination;
 - limiting/stopping spread to caribou;
 - don’t want parks to be seen as reservoir of CWD;
 - need for national coordination and leadership;
 - address baiting and feeding in adjacent jurisdictions
- Common ground:
 - Agreement that CWD not native to our ecosystems,
 - recently introduced to SK from SD (from Colorado origin)
 - eradication in the wild is practically impossible
 - control may be possible – costs?;
 - very crude tools
- Implications:
 - Risk to elk translocations and primary management tool in Elk Island National Park;
 - fear of reduced visitation to parks;
 - may affect environmental integrity of some parks;
 - potential of affecting species at risk (caribou)
- Where are we going:
 - Parks Canada CWD strategy;
 - agreement on scope of problem;
 - different strategies for different areas;
 - research (predation?);
 - cannot plan in isolation;
 - largely affected by approach and risk assessment of adjacent jurisdiction
- Barriers
 - no evidence of zoonotic transmission;

- no threat to domestic animals;
- wildlife are a public resource, conflicting authorities
- conflicting management tools;
- lack of effective management tools;
- hard to sell
- Summary
 - Can't be managed in jurisdictional silos; needs coordination;
 - Protected areas can contribute towards understanding the disease
 - One size doesn't fit all
 - Other disease issues will distract from CWD efforts (relatively low priority in Ottawa)

B. Breakout sessions

The second portion of the workshop consisted of 8 small group working sessions, each group tackling an assigned topic. The group was asked to discuss the appropriate wildlife management approach in each of the three risk scenarios regarding CWD in wild deer and/or elk: enzootic, newly-detected, and at risk. The discussion was further divided into first identifying possible response elements (Saturday morning discussions) and then assessing the possible efficacy of the identified response (Saturday afternoon discussions). Two reporting sessions were used for each group to report their findings to the general audience and invite further input, clarification, and discussion. Ongoing findings were recorded on flip charts and reporting sessions were captured with additional notes, as recorded by Nancy Facklam, Senior Technical Advisor, Alberta Agriculture and Rural Development.

B-1. Breakout session I: Possible response elements

B-1.1 Should the wildlife agency response plan advocate eradication or control of CWD?

Enzootic

Eradication is considered unrealistic in enzootic areas with the current tools available to wildlife agencies. Therefore some level of CWD control should be the guiding principle for determining program goals. The level of control should be guided by thorough assessment of the risks posed by the disease and the response.

Control modes could include

- limiting further spread to unaffected areas;
- documenting the occurrence of CWD and monitoring changes such as geographic distribution, spillover to other species, prevalence/ abundance in primary species;
- limiting carcass movement across boundaries of enzootic areas
- limiting live cervid movement across enzootic boundaries

- game farm regulation and enforcement
- ban on baiting and supplemental feeding wild cervids

One of the limiting factors faced by agencies in enzootic areas is not knowing the prevalence/abundance of CWD in wild deer. Agencies may want to focus on documenting and measuring the spread from enzootic areas. *A critical factor is to assess at what level the agency can live with CWD and still maintain funding and public support to help direct control actions.*

Newly-detected

As in enzootic areas, it is essential to base agency program goals on solid assessment of CWD risk factors. It is also essential to establish intensive surveillance that is good enough to detect true first cases that reflect recent arrival of CWD in an area. Agencies are encouraged to consult the review of recommended surveillance methods for CWD in wild populations (available at http://www.nwhc.usgs.gov/publications/fact_sheets/pdfs/cwd/CWD_Surveillance_Strategies.pdf).

If adequate surveillance is in place when the first case of CWD is found, then it is reasonable to assume that the disease occurrence is recent and CWD eradication should be considered. If the surveillance was incomplete or there is reason to believe the disease has existed in the population for some time prior to its ‘discovery’, control methods should be applied, as outlined above in B-1.1 a.

Some elements to consider include whether the ‘first’ animal was a clinical case (emaciated or found dead deer), a subclinical deer, a road-killed deer, or an apparently healthy hunter-killed deer. Diagnostic results identifying the presence of prions in lymph versus neural tissues will provide additional information that should be considered. Clinical cases and brain-positive cases indicate a longer time period of infection and perhaps longer occurrence of CWD in the area.

Geographic distribution of cases, pattern of occurrence (clustered vs widespread), and species involved are important factors in assessing CWD risk, particularly in newly detected areas. It also is important to identify the source of the CWD and apply means to limit further introduction.

At Risk

Areas beyond the known range of occurrence of CWD or with no known risk factors for CWD should develop a Risk Management Strategy (including measures to avoid introduction of CWD and what to do if it is detected), and implement an intensive surveillance program (to ensure that CWD is not present and to lay a foundation in case CWD occurs in the future). Risk avoidance measures should include a series of restrictions applied to movement of live cervids and dead cervid parts – more information provided in B-1.4.

B-1.2 What aspects of the disease ecology of CWD can we control or manage in a CWD response plan?

Disease theory indicates an attack on the rate or potential for transmission is a reasonable approach to manage disease. Wild cervids are social animals and population density/rate of contact is one element that could be used to limit direct disease transmission. CWD appears to follow cervid movement patterns on a large scale (dispersal, seasonal migration) and a smaller scale (social structure). Specific to the ecology of CWD, there is a long-term incubation period (but unknown period when infectious), chronic impact on individual cervids and perhaps long-term population dynamics, potential involvement of multiple cervid species, and an unknown element of environmental contamination in some situations. CWD is uniformly fatal (no known recovery).

Thus, actions to control or manage disease ecology of CWD include reduce population density, reduce environmental contamination; reduce deer dispersion; improve disease surveillance, particularly detecting disease in new areas; reduce risk of carcass movement; improve proper disposal of wild and farmed cervids; eliminate supplemental feeding and baiting of wild and farmed cervids; integrate research with monitoring and management efforts; regulate movement of live farmed and wild cervids as well as movement of cervid feed.

Enzootic

Depending on the level of control/management determined in the agency CWD strategy, any or all of the above-mentioned actions could be applied in enzootic areas. However, given the enzootic nature of the disease, application of these responses in peripheral boundaries of the enzootic area are likely to be more effective. Regulation, particularly documentation, of the movement of live wild and farmed cervids is considered particularly appropriate in enzootic areas.

Newly-detected

Responses to consider include population reduction, particularly in and around disease hot spots ('sparks'); control of feeding, baiting, and movement of wild and farmed populations; and prevention of movement of CWD-risk materials

At Risk

Within At Risk areas response should be targeted in areas closest to known positive areas/jurisdictions or in the vicinity of potential CWD risks. Responses to consider include restrictions on live cervid imports; discourage artificial concentrations of cervids; investigate/understand natural movements of wild cervids, particularly in areas adjacent to known CWD occurrence. Agencies may want to consider preventative population reduction to reduce the risk of future CWD occurrence. Regional coordination and cooperation to develop integrated plans is strongly advised.

The following QUESTIONS were identified by the group but left unresolved ???

- i. Differences between East/West US and Canada with regards to white-tail populations?
- ii. Proposal to limit movement of wild pops? Population reductions in areas of risk (e.g., AB/SK).
- iii. Human movement of wild animals.
- iv. Effect of habitats on clustering and local disease transmission. Landscape barriers and using habitat to reduce concentrations of animals.

B-1.3 What is the role of hunter harvest and how can it be delivered in a CWD control response plan?

Group Three participants took a slightly different approach to the task. Their discussions focused primarily around identifying roles for hunters and secondarily how they could be applied in different risk scenarios.

Title: Role of Hunters in Various CWD Management Activities

CWD Management Activity	Enzootic	Newly Detected	At Risk
Surveillance	+++	+	++
Clinical Suspect Removal	++	+	+++
Deer Population Reduction	++	+	+
Deer Age/Sex Structure Change	+	++	+

Focal Area Deer Removal	limited	limited	limited
Carcass Movement Biosecurity	+++	+	++
Baiting Restrictions	+++	+++	+
Removal of Escaped Farmed Cervids	+	+	+

Key: + somewhat useful; ++ useful; +++ very useful

Issues in using hunter-harvest as part of CWD control efforts:

- How do you get hunters doing something that is not in their own immediate self-interest?
- How do you increase hunter success rate, especially in light of trends towards decreasing number of hunters, time in field, etc?
- How do you maintain hunter interest as population densities decline in CWD response areas?
- To make optimal use of hunter-harvest for surveillance, is it necessary to have mandatory sampling or is voluntary hunter participation good enough?
- Does hunting result in a sufficient increase in deer movements that there could be an impact on disease spread?
- What tools facilitate hunters participating in removal of CWD clinical suspects? Things that have been tried include replace tags for current or next year, replace with negative meat, reimburse processor costs, \$\$ incentives.
- How do you keep hunters hunting in areas of CWD occurrence? Things that have been tried include provide individual results to all hunters, direct contact with any hunter who takes a positive animal (combined with offer to replace tag, replace meat), lower licence fees, 'earn a buck', longer seasons, landowner incentives to hunt and to allow hunters, raffle with names of all hunters who submit heads for testing, ...

B-1.4 What guidelines for carcass disposal, carcass movement, and disposition of 'orphan' fawns/calves are appropriate to control CWD?

In general, the importing or exporting jurisdiction has a moral obligation to address the risks associated with ingress or egress, respectively, of potentially infected materials/animals.

Enzootic

Carcass disposal: Even though the disease is enzootic in the area, it is prudent that the agency consider reducing surface contamination of environment. The response would be to implement restrictions to avoid leaving cervid parts on the landscape. However, this may not be a big issue in enzootic areas.

Carcass movement: Export control is the only issue. The response would be restrictions on the movement of cervid carcasses out of the enzootic area.

Fawns/calves: The most appropriate disease control response is to euthanize potentially infected fawns/calves. If this is not possible or not socially/politically acceptable, fostering at an approved

rehabilitation facility using approved methods designed to maximize survival of fawns/calves returned to the wild, and release deep within enzootic zone could be considered. Fawns/calves should NEVER be moved into or out of an enzootic area.

Newly-detected

Carcass disposal: Avoid surface contamination of the environment. Disposal of potentially-infected cervids should occur in approved landfill or deep burial sites. Small numbers of carcasses or project-specific cervid carcasses can be incinerated.

Carcass movement: Export and import control of cervid parts is appropriate in areas of newly-detected CWD.

Fawns/calves: As above, euthanizing fawns/calves is the safest disease control response. In newly-detected areas, application of an approved live animal test that detects very early infections and release in a manner consistent with maximizing potential survival could be considered. Note that most current live animal tests (tonsil, retropharyngeal lymph node, or rectal lymph biopsy in deer and elk) may not be useful in detecting CWD in very young animals. Fawns/calves should NOT be moved out of the newly-detected area, and particularly not into an At Risk area.

At Risk

Carcass disposal: It is important to avoid creating an infected environment. Thus education programs for hunters and others who dispose of cervid carcasses, such as highway departments or contractors who remove road kills, is perhaps the most important response to consider. Options for the safe disposal of carcasses in landfills or burial sites should be included in the information materials. Past experience suggests that agencies will need to reinforce the message, particularly prior to hunting seasons and the rut, when cervid movement and the incidence of road-kills increases. Similarly incentives to maintain interest should be considered.

Carcass movement: Import controls are particularly important in At Risk areas. Agencies need to reinforce that CWD exists elsewhere, even though it is not in the At Risk area, and that **PREVENTION IS THE BEST PROTECTION!**

Fawns/calves: Foster and release is appropriate in areas where CWD is not detected and surveillance programs are sufficient to provide reasonable assurance that it does not occur. An approved live animal test (as above) could be considered prior to release and would provide additional information for ongoing surveillance programs in AT Risk areas. It is important that fawns/calves from enzootic areas NEVER be released into At Risk areas.

Unresolved Question:

What are the options for sending offal to renderers, particularly in situations where they will not take CWD material from positive areas? Although not officially a designated Specific Risk Material (SRM) in the context of BSE management, cervid offal in some areas may be treated as a SRM.

B-1.5 What is the role of targeted local herd reduction and how can it be delivered in a CWD response plan?

The first aspect of local herd reduction is to determine when to use it in a management program. Targeted local herd reduction is considered appropriate when the program goal is to:

- stamp out isolated cases of CWD. This may be the first case of CWD in a jurisdiction or a new ‘spark’ in an area not previously known to have CWD
- reduce further spread of CWD in newly-detected areas or perhaps on the boundaries of enzootic areas [latter point not unanimous]
- monitor CWD in ongoing affected areas
- to address public perception of CWD. The program will increase awareness and validate the importance of CWD management.

Some inherent aspects to consider in applying herd reduction include

- the primary cervid species involved: white-tailed deer, mule deer, elk (not considered appropriate for moose)
- focused culling of a migratory species/population
- local geography and habitats; agency resources now and in the future (manpower & money)
- animal density and probability for disease spread
- pre-cull density in the targeted area and the potential influence on the rate of repopulation
- size of cull area
- public perception and power to influence agency decisions/programs
- land ownership patterns
- whether density reduction is feasible in light of the agency-specific and/or site-specific factors mentioned above

In order to fully evaluate and to learn from herd reductions, it is necessary to design the cull with appropriate measurement capabilities, long-term follow-up monitoring, and opportunities for insertion into an adaptive management framework. This should be done within a research framework identifying what you hope to learn, what is an appropriate sample size, and how to assess what is learned.

A further underlying question is whether prevalence is the best measure for assessing effects of herd reduction. The answer generally is NO. Infection levels tend to be relatively low in wild populations, and combined with inherent weaknesses and potential bias in samples tested, make it extremely unlikely that significant changes in prevalence (percent infected of the total tested) can be detected. This does not however mean that herd reduction did not significantly change the number of infected individuals, the potential for further transmission, or the rate of spread to new areas or new individuals.

Enzootic

Within an enzootic area, delivery of targeted local herd reduction could reduce the likelihood of ‘sparks’ jumping into new areas and thus reduce the rate of disease spread on the periphery of the affected area; ring culling to reduce animal density around a core area and provide a buffer zone to unaffected areas; hot spot culling to address local areas of increased prevalence, reduce

predisposed populations (genetics), reduce local transmission rates, and reduce environmental contamination.

Newly-detected

The use of targeted local herd reduction depends on the identified motives and goals of the agency strategy for controlling CWD. It seems most applicable in situations of slowing CWD incursion from an adjacent enzootic area or for keeping CWD out of unaffected portions of a jurisdiction. There is significant long-term financial benefit to limiting the probability of CWD establishing or spreading. Again the adage came up that **prevention is the best disease management response.** Herd reduction in newly-detected areas can be used to address sparks, establish a buffer up against an enzootic area, and reduce the potential for environmental contamination.

At Risk

Targeted local herd reduction can be outlined in a template response scenario in the management contingency plan. This allows the agency to begin the dialogue with stakeholders prior to CWD occurrence and increases the probability that it will be supported.

General comments on how to deliver herd reduction:

- Introduce predators as they may cue in on debilitated individuals
- Introduce a cervid diseases such as EHD/BTV
- Use directed hunters with dogs
- Use of agency sharpshooters
- Apply reproductive controls/contraceptives
- Other techniques may be less palatable but could be assessed, such as snares, poison
- Change hunting rules in designated disease control areas. Consider spotlighting, shooting from roads, baiting (only if monitored and in conjunction with directed cull)

UNRESOLVED QUESTIONS/ISSUES

In enzootic and newly-detected areas, there remains an issue of using bait as part of a cull program. Baiting can maximize efficiency of the removal and the expenditure of limited manpower and funds; however, this should only be done in situations where the baiting does not artificially concentrate animals that may not be culled. That is, baiting in areas where animals are already concentrated should not affect CWD transmission. Baiting to draw animals together in order to cull may indeed increase the risk of transmission, particularly in enzootic areas. This would also potentially increase the risk drawing new animals into a contaminated cull area.

B-1.6 What is the role of test/remove or novel interventions and how can they be delivered in a CWD response plan?

Enzootic

Questionable use in an enzootic area. There is likely to be little impact over the long term, especially if environmental contamination has reached the level of being significant in the transmission dynamics. Interventions will enhance surveillance, but will not eradicate the disease. On the positive side, control will not eradicate CWD but it may buy good will and support if it brings about a decreasing incidence/prevalence/abundance of CWD

Some possible interventions include

- Predation – predators tend to selectively go after clinical animals, but not sure how effective this would be in an enzootic area; may decrease prevalence but will not eradicate disease.
- Selective culling – stress/assess animals first to identify infected animals.
- Sharp shooters – cheaper than test and cull, and more effective in getting infected animals
- Vaccination – concerns: once the program is underway, how can we differentiate vaccinated from non-vaccinated individuals? Will there be increase environmental contamination with increased life span?
- Birth control
- Exclusion fencing

UNRESOLVED QUESTION – How to remove animals faster than new individuals are being infected. And how to determine if the novel approach is working.

Newly-detected

In Newly Detected areas, time is of the essence. Actions and assessments should not be delayed, even though return of investment in newly-detected areas is likely to be low. There are few infected deer and a more direct approach is needed in order to make a significant change in the disease dynamics. A targeted removal strategy can be very effective in such situations and is the response of choice. The response needs to be supported by suitable surveillance and management. All stakeholders should be reminded that effective disease control will take time. There may be opportunities in newly-detected areas where research on the potential effects of predation may be testable as an important aspect of the management program and may be more measurable than in enzootic areas. For example, Yellowstone National Park (natural experiment).

At Risk

Not applicable in At Risk areas since disease is not present. However, increased predation may contribute to lower cervid populations and reduce the risk of CWD occurring in the future. It could selectively remove infected individuals if the disease or a spark occur, and may contribute to reduced environmental contamination with fewer cervids in the area.

B-1.7 What is the role of manipulating deer movement and how can it be delivered in a CWD response plan?

Editor's note: participants indicated that this question overlaps with other topics and it was not specifically addressed.

B-1.8 What is the role of manipulating deer density and how can it be delivered in a CWD response plan?

Manipulating deer density is considered a good response tool based on broad disease management theory but there are limited data to evaluate actual effects. Application of this response needs to be carefully thought out and designed in the context of long-term adaptive research projects. Management should occur in the interim as research provides ongoing input. The research design

applicable to all three risk scenarios should include:

- Manipulating density and contact rate
- Controls
- Multiple locations
- Age structure
- Sex ratios

Social acceptance (e.g., hunter acceptance, landowner approval, local business support) of cervid population manipulations varies in different areas and agencies should be inclusive in their public communications in order to assess and maintain support, including cervid farmers.

Enzootic

Suggested responses in enzootic areas range from no density manipulation in core areas to perhaps extensive action along edges of enzootic area (good neighbour policy).

Newly-detected

Density manipulation is recommended and should occur in conjunction with targeted surveillance. Baseline prevalence should be determined.

At Risk

Density manipulation in the absence of disease occurrence can be difficult to support. However, in assessing potential CWD risk, agencies should consider the distance, terrain, and habitat type, as well as the cervid movement patterns and overall density of wild cervids in relation to the proximity to known occurrences of CWD in adjacent jurisdictions. Regional and/or inter-agency cooperation and communication is important in assessing disease risks. Given the burgeoning cervid populations across North America, it is recommended that wildlife agencies at least limit cervid populations at or below management objectives.

UNRESOLVED QUESTION:

Is the disease frequency or density dependent? Limiting the number of infected cervids (that is, reducing the frequency of disease) may be more important than reducing density. It may be a more direct effect on reducing the infectious period when transmission can occur and therefore limit disease dynamics. It may not eradicate disease, but it may reduce prevalence.

What is the most effective way to reduce density: age/sex vs. numbers? Research should be directed towards answering this question. We all need a long-term collective management experiment.

B-1.9 How do management agencies gather and maintain public and/or political support for a CWD response plan?

In general, agencies need to develop and deliver ongoing effective communication, messages should be consistent within and among wildlife agencies and in conjunction with associated disciplines, particularly agriculture. CWD programs often come up against reactive public and/or self-interest groups that often operate on opinions, not facts. Agencies themselves need to ‘get out

in front’ and be more proactive, less reactive. Communication/education is the key. A critical element to consider is how to maintain interest and avoid message fatigue over time. Over the long run, media stories supplant agency messages. Media often focuses on individual controversial or conflicting opinions while the agency is left trying to promote ongoing success – a hard sell at the best of times. Solidarity among agencies will help build public trust. Cross-disciplinary and cross-jurisdictional approaches are encouraged. Similarly, it is important to make sure all stakeholders know what is going on, particularly in light of the long-term nature of CWD management.

UNRESOLVED QUESTIONS:

Are there basic communications differences between agencies responsible for management of farmed and wild cervid agencies (e.g., cultural differences; conflict of missions)? CWD is a shared disease; working in isolation will not solve the problem. All agencies are stakeholders and have a stake in the solution. Wildlife and agriculture agencies must be in the same room! This provides broader support and ensures that decisions come from the whole group, not just one agency. This is especially important in the risk assessment stage of developing CWD management and communication plans.

Enzootic

Even though the disease is well established in enzootic areas, it remains important to communicate among agencies and jurisdictions. Parks may play a special role in disease dynamics and park managers should be included in communications networks. It is important to be transparent with all public stakeholders. Communication plans are not static, they need to be reviewed regularly and adjustments made in light of new information or in order to keep the messages refreshed and thereby avoid ‘message fatigue’. Stakeholder feedback is key to continued buy-in; stakeholders must feel like they are engaged, and are being listened to. It may be important to change the metrics for new ways of looking at the disease; prevalence, while a relatively easy concept for lay publics to comprehend, is not the best way to measure disease nor disease management success. Consider using professionals to create social change.

Time can become a major impediment to ongoing CWD communications as staff burnout factors sets in: the messages are not easy to deliver and communications are at times constant for long periods (years) and yet there is no obvious end in sight! The longevity of the issue can exceed the stamina of those delivering the messages. The elements of the message are difficult concepts to explain (e.g., reduction in population vs. environmental contamination; not a human health concern... but do not eat positive animals; emphasizing uncertainty confuses the public yet waiting for clear answers is not acceptable to most agencies charged with stewardship of public resources). Maintaining a unified message among staff and between agencies is important. Emphasize what is known. Recognize that public desire to have everything known are unrealistic. All aspects of wildlife management are delivered on less than complete knowledge and disease management should not be judged differently or held hostage to unrealistic demands.

Newly-detected

As in enzootic areas, it is important to communicate a consolidated message among agencies and disciplines. Focus on common interagency and interdisciplinary messages; recognize each other’s authority. It is important to identify what agency has regulatory capacity and establish the primary messages from within the agency that can/will provide the greatest support and impact.

At Risk

An important first step is to get stakeholders together. Be open and honest with the information in order to build trust. Everyone at the table should agree on an appropriate response to the first finding of CWD. As in other areas, cross agency cooperation is essential to a successful CWD communication plan. In advance of the occurrence of CWD, agencies in At Risk areas may have the time to conduct socio-economic analyses of proposed response plans in order to gather support or detect resistance to the plan. It remains important to communicate early in the process that CWD management is not a quick fix and that no one has all the answers.

B-2. Breakout session II - Assessing efficacy of responses

The general approach to the second set of breakout sessions was aimed at discussing measuring efficacy of CWD response programs for managing CWD in wild populations. Participants were asked to reconvene in their previous breakout group and discuss aspects of measuring the response associated with determining who is responsible, the level of confidence in the measurement, as well as what and how to measure CWD management response in the context of the topic addressed in Breakout Session I.

B-2.1 Should the wildlife agency response plan advocate eradication or control of CWD?

What to measure?

All risk areas should consider looking for a more convenient diagnostic test, as well as new approaches to funding and structure of a suitable surveillance system to improve chances of finding cases of CWD. Consistency in the tissues used and tests applied among agencies is important for improved credibility and assurance of detection. Surveillance structures could include check stations (mandatory? Voluntary? Electronic?), processors (concerns about sample size and bias?), road kills (involve transportation department or maintenance contractors), targeted removals, and/or taxidermists (some problems with lack of data from private hunt clubs (defined as non-fenced private land with no public access) and no access to trophy heads).

In Newly Detected areas it was considered appropriate to measure: the value of using prevalence as a metric to describe disease occurrence, the extent of the public relations effort, the level of public buy-in, and the extent of enforcement of rules already in place. It is important also to document and measure possible spread to surrounding areas; hunter license sales; and stakeholder awareness of CWD.

In Enzootic areas/locales where disease control is the goal, deer density, sex/age distributions, and mobility of local populations should be measured. Sample size, time frame, and geographic distribution should be considered. Road kill rate, CWD incidence, and effectiveness of regulatory tools can provide important information to assess response activities. In areas/locales where test and remove programs are in place, changes in disease prevalence and geographic area can be measured.

How to measure?

In Newly Detected areas, agencies could consider using incidence (defined as the number of new cases

over time) or prevalence (the proportion of animals tested that are positive for CWD). Data indicating spread of CWD to adjacent areas also would be a measure of the effectiveness of the management response if controlling spread is one of the program goals.

In Enzootic areas, prevalence may be a reasonable measure of the extent to which the disease dynamics are changing and can be assessed in light of the response program goals and activities.

Who does the measuring?

In all risk categories it is likely the agencies with the most financial resources and commitment will measure the response. Measurement should be done in consultation with experts.

Level of confidence in each resulting measure?

In all risk areas, confidence in the measure will depend largely on the detection level of the ongoing surveillance program. Elements to consider include sample size, time frame, and geographic distribution of the disease. Confidence will be improved if sample sizes are large.

B-2.2 What aspects of the disease ecology of CWD can we control or manage?

What to measure?

In Enzootic areas, agencies could measure reduction in population density, the cumulative number of CWD cases, prevalence of CWD (with some predetermined denominator reflecting an appropriate boundary to the statistic), density of cases, and/or density of new cases. These should be assessed over time using a randomized, consistent, unbiased wide-spread surveillance sample. It is important to maintain the same sampling strategy and effort over time. With regards to feeding and baiting, agencies could measure compliance rate with banned or excluded activities and monitor the number of violations. The number of farmed cervid movements and compliance with game farm regulations could be measured. Movement and genetic relatedness of local live wild cervid populations is largely unknown – research is required to provide better inputs to the ongoing risk assessments. Information regarding dispersal and daily/seasonal activity are particularly important. We need to develop better tools to predict disease occurrence and changes in basic population parameters, with and without disease in the population. Key things to measure include extent and severity of disease over time, habitat availability, habitat preferences, and documented habitat use. It is important in enzootic areas to determine the edges of the enzootic area.

In Newly Detected areas, efforts should be focused on measuring localized population reduction (particularly the number of infected animals removed) and the extent of intensive surveillance around those areas. Understanding species distribution and natural movement patterns of wild cervids will better inform the surveillance efforts and assess the effects in the area around the managed zone.

In At Risk areas, surveillance methods should be tiered in accordance with distance to known risk and assessed accordingly. Regulatory compliance with respect to feeding and baiting, education, and habitat modification also should be assessed. Risk of movement from the closest infected areas should be measured, within the regional cooperation used to develop response and contingency strategies. The extent of communication with public and stakeholders, particularly with regards to the integrated nature of the plans should be measured.

How to measure?

Movement data based on radio-transmitters and population genetics serve as a measure of both dispersal and daily/seasonal activity. Measurement of the number of positive cases over time within a certain area can be used to monitor whether control activity is reducing the prevalence and/or number of CWD cases (Note this requires estimates of host density and the percentage of the population needed to detect disease).

Who does the measuring?

Agencies and research groups.

Level of confidence in each resulting measure? Editor's note: the group ran out of time and did not get to this question.

B-2.3 What is the role of hunter harvest and how can it be delivered?

What to measure and how to evaluate the role of hunters in various aspects of CWD management?

Surveillance: As a component of CWD surveillance, hunter harvest contributions must be measured in light of the program objectives. An important measure is whether the surveillance objectives are met. To look at efficiency, you could estimate the numbers of hunters /sample collected and this might help evaluate whether voluntary hunter submissions work or whether mandatory submission scheme are needed.

With targeted (clinical) surveillance data, the number of hunters per sample from a clinical suspect or maybe better, the number of contacts per submission over time (trends) can be used to measure effectiveness of hunter harvest as a surveillance tool. This will only be effective in areas where clinical suspects occur and in habitats where they can be seen.

UNRESOLVED QUESTIONS:

How do we use surveillance data that includes hunter harvest, check station deer, car-killed deer, targeted removal (clinical) deer and deer collected during targeted herd reductions? Their inherent value as a representative of occurrence of CWD within a population differs widely. Need a weighted system (e.g., hunter harvest is biased and is not evenly distributed, vehicle encounter rates differ among different habitats and rural population variances, directed programs will find more infected deer).

Is prevalence the optimal metric for trend monitoring? No. But do we have anything better?

How best to estimate hunter effort? Harvest data? Surveys? Do phone surveys provide reliable results?

Cervid population management/reduction: Measurable elements include harvest numbers, cervid population estimates (before and after management response); cervid age/sex ratios, hunter effort/success (use diaries or survey of animals sighted and include animals other than cervids as well as other indirect measures such as licence sales). Survey questions should measure hunter participation (e.g., hours spent hunting, where they hunted, what they hunted).

Limiting Carcass Movement/Reducing Risks: Measurable elements include the number of enforcement events, provide dumpsters and measure the tonnage of waste, contact individual hunters, survey for offal, add appropriate questions to ongoing hunter surveys being applied in many jurisdictions, and contact taxidermists to get an estimate of where animals are coming from/go to. A review of agency export/import permits, where applicable, may identify the extent of some carcass movement.

Baiting Restrictions/Compliance: Measuring efficacy of the response could include tracking the number of enforcement actions (this may involve a graduated implementation), aerial surveys to document/estimate/extrapolate the number of bait sites, restrict/monitor the volume of sale of bait items

such as whole kernel corn (this could be linked to a whole other body of concern regarding invasive species coming in with imported feed/seed?)

Who does the measuring to monitor the efficacy of hunter contributions to various aspects of CWD management?

Hunters can help assess hunter effort as well as harvest numbers, species, and gender. Beyond that, wildlife agencies will primarily do the measuring. University involvement (as a third-party) also can be considered.

Level of confidence in the results when monitoring the efficacy of hunter contributions to CWD management?

- harvest numbers – high
- aerial surveys - medium
- hunter success surveys, diaries – low to moderate
- hunter participation through licence sales – low to high (high confidence in actual sales, but interpretation not straightforward; license purchase does not necessarily equal participation in the hunt.)
- dumpster monitoring – low
- survey questions - uncertain
- enforcement events – high for what is actually recorded

B-2.4 What guidelines for carcass disposal, carcass movement, and orphan fawn/calf disposition?

What to measure?

There is no gold standard for measuring elements of carcass disposal and movement. Similarly there currently is no way to detect and monitor prion material in the environment. Thus agencies will need to use surrogate measures.

Carcass disposal: measure compliance with approved disposal methods. This could then be adjusted in light of carcasses disposed vs. number of licenses (this is really a social science project and should be addressed in conjunction with appropriate expertise in assessing human behaviour). The use of transportation corridors and supplemental dump sites can be assessed as further indicators of compliance.

Carcass movement: the rate of import or export of cervid offal or rendered cervid materials could be measured.

Fawns/calves: monitoring rehabilitation records may provide evidence of how many fawns/calves are handled and their eventual disposition.

UNRESOLVED ISSUE:

There is no crime until the carcass is carried across a jurisdictional boundary – but then the originating agency has no jurisdiction.

How to measure?

Carcass disposal: Remote sensing technology can be used to detect gut piles (Far fetched)? Could perhaps monitor clusters of scavenger activity – magpies, ravens, eagles, coyotes, wolves.

Carcass movement: A tally of hunter-kills passing through check stations, survey sites, highway surveillance checkstops can be taken. Further information may be gained from checking with the receiving destination. Additional surveys of taxidermists/ meat processors (3rd party surveys) can be undertaken. Enhanced surveillance can be used surrounding dump sites/transportation corridors (do these create higher risk conditions?).

Who does the measuring?

Wildlife agency or 3rd party (research)

Level of confidence in each resulting measure? Editor's note: the group did not comment on this.

B-2.5 What is the role of targeted local herd reduction and how can it be delivered?

Editor's note: for the second breakout session, group 5 combined with group 8. The cumulative comments are listed below.

B-2.6 What is the role of test/remove or novel interventions and how can they be delivered?

What to measure?

In Enzootic areas, efficacy of the response activity may be reflected in the distribution of CWD cases at edge of affected area and how fast the disease is moving. It may be important to determine whether it is better to measure incidence or prevalence. The extent of predation and the selective removal of positives may be an added measure of changes in disease occurrence. Agencies should address how to detect prevalence over time, particularly in areas of low disease prevalence.

In Newly Detected areas, measurable elements include prevalence, incidence, and distribution of CWD cases. Test and remove may be important in some areas. It is important to define the at risk population.

How to measure?

In Enzootic areas, the appropriate time frame is difficult to estimate: probably more than 5 yrs; perhaps 5 to 20 yrs as a minimum. It may be better to test a high proportion of cervids every few years rather than lower numbers every year. Suitable models can be useful in evaluating different scenarios. Live capture or live animal tests may be good means to measure the efficacy of response actions, for example, annual recapture and assessment of CWD status. As above, estimating predation rates may reflect changes in prey susceptibility associated with changes in disease occurrence. A research project involving radio collars on prey and predators could be used. Changes in the rate of cases collected by hunter kills may have a similar interpretation?

In Newly Detected areas, as with the application of suitable response activities, measurement should be timely. The size of the area assessed, in the context of the habitat specifics and species involved, should be measured. Sentinel herds could perhaps be monitored to detect changes in disease occurrence under different management schemes. Scat analysis from predators could perhaps be used to detect prions in new areas?

Who does the measuring?

Whoever has the money and jurisdiction.

Level of confidence in each resulting measure?

- Distance to closest risk HIGH
- Perimeter of affected area LOW
- Prevalence HIGH
- Incidence MEDIUM

B-2.7 What is the role of manipulating deer movement and how can it be delivered? (covered off within other topics)**B-2.8 What is the role of manipulating deer density and how can it be delivered? (in conjunction with group 5)****What to measure?**

- Prevalence
- Force of infection
- Incidence

Reduction in population should lead to fewer positive cases and fewer infectious contacts, leading to a reduction in transmission thus affecting the disease dynamics.

How to measure?

The standing crop, before and after density manipulation, CWD status of removed animals, and age/sex composition of the population may reflect the effects of program aimed at changing density or reducing the number of cervids in local populations. Agencies need to look at different aspects of density; knowing who is transmitting disease to whom helps to know who to remove. Habitat type and local geography should be included in the assessment. Location and date of harvest may reflect management responses. Changes in social structure or the number of contacts between animals may reflect altered structure of infectious contact– but how to measure these changes will be increasingly difficult as number of cervids declines. Development of a prion Geiger counter would help assess potential environmental contamination.

UNRESOLVED QUESTION:

Are disease management and recreational management incompatible goals? **Measurement of changing cervid density or abundance need time!** A limiting factor may be what is socially acceptable and this too may change over time.

Who does the measuring?

Whoever has the money. Does any agency have the money?

Agencies, universities, or perhaps a consortium of multiple provinces and states.

Level of confidence in each resulting measure?

The level of confidence is directly related to the fiscal resources applied to the measurement activity. It can be improved with a study design involving paired sites and leading to suitable statistical confidence and power analyses.

B-2.9 How do management agencies gather and maintain public and/or political support?

What to measure?

Delivery and comprehension of the message (do you understand it, do you do it).

Achievement of communication objectives and milestones

Acceptance of Response/Approach

Social and/or behavioural change in response to the message.

Achievement of collaboration milestones: Political, Public, or other stakeholders

How to measure?

- Public and hunters: use polls and surveys, media scanning, feedback forms, incoming correspondence, public meetings, human dimension studies, peer review of the approach. Use milestones (goals be predetermined dates).

- Political groups and agencies: as above. Also funding levels, evaluation systems, and leverage points provide ongoing assessment of whether anything changed according to our message or do we need to adjust the message. Similarly changes in policy will reflect efficacy of the messages. MOUs, media scanning, feedback forms, stakeholder mapping, and peer review also can be used to measure program effects.

Who does the measuring?

NGOs, government audits, auditor general, treasury board, social scientists consultants, internal reviews.

Level of confidence in each resulting measure?

In general, confidence in the communication activities is reflected in ...

if you do a good job, you still have a program;

if it was a poor job, the program no longer exists.

C: Workshop Presentations

Workshop presentations are provided as stand-alone .pdf files in association with this report document.

D: Participant List

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Appendices

I: Workshop Agenda

II: Small Group Facilitator Notes

III: Tabular Summary of Workshop Results

Appendix I

Chronic Wasting Disease Workshop

August 8 and 9, 2008

Co-hosted by

**Alberta Sustainable Resource Development, Fish and Wildlife Division
and Saskatchewan Ministry of Environment, Fish and Wildlife Branch**

Theme: CWD Response Programs: Efficacy and Recommendations

The goal of the workshop is to create a science-based document to support the development of response plans and interjurisdictional consistency.

Approach:

Speakers will provide an overview of wildlife agency programs designed and delivered in response to findings of CWD in wild cervids in different jurisdictions in Canada and the USA.

Speakers will discuss the current programs, their success and failures, and may offer recommendations for future CWD response planning and programs.

In breakout sessions (using the table provided below), workshop participants will discuss the merits of various response activities and provide recommendations in three risk scenarios: enzootic, newly detected, at risk (not detected).

Breakout groups will present their recommendations to the larger group for discussion.

Workshop organizers will compile information from breakout sessions with comments and concerns expressed by the larger group and will forward that document to all participants for review within two weeks.

Areas of contention will be identified (perhaps not resolved).

The final document, containing the cumulative wisdom of the group, will be provided to all workshop participants and possibly to others identified by workshop participants.

Framework for Recommendations			
CWD STATUS	RESPONSE ACTIVITY	EFFICACY	RECOMMENDATIONS
ENZOOTIC			
NEWLY DETECTED or newly established			
AT RISK (not detected)			

Chronic Wasting Disease Workshop		
Friday, August 8, 2008		
Time: 1:00 to 4:30 pm		
Venue: Wild Rose Room, Lister Conference Centre, University of Alberta		
Time	Activity	Facilitator/Presenter
1:00	Welcome/workshop purpose/housekeeping	Abercrombie/Pybus
1:10	Overview of CWD (CWD 101)	Bryan Richards
1:40	Break	
1:50 (~20 min each)	Response Programs in CWD Enzootic Areas: Wisconsin Wyoming Nebraska	Julia Langenberg Terry Kreeger Bruce Trindle
2:50	Break	
3:00 (~20 min each)	Response Programs in CWD Newly Detected Areas: West Virginia Kansas; (& NY) Alberta	Jim Crum Ruby Mosher; (read in) Pybus
4:00 (~10 min each)	Response Programs in CWD At Risk Areas: Ontario Maryland Manitoba	John Dungavell Cindy Driscoll Richard Davis
4:30	Wrap up and Adjourn	

Chronic Wasting Disease Workshop		
Saturday, August 9, 2008		
Time: 8:30 to 4:00 pm		
Venue: Wild Rose Room, Lister Conference Centre, University of Alberta		
Time	Activity	Facilitator/Presenter
8:30	Review of agenda	Abercrombie/Pybus
8:35	Workshop output: Recommendations for future CWD response plans and programs designed for enzootic, newly detected and at risk CWD areas.	Abercrombie
8:45 (~15 min each)	Response Programs/contingencies in National Parks: US Parks Service (enzootic) Canada Parks Service (at risk)	Jenny Powers Todd Shury
9:15	Break	
9:25	Breakout session I: Elements of Response (refer to List of Session I topics)	Small groups
10:30	Break	
10:45	Workshop breakout session reports	Large group
12:00	Lunch	
1:00	Breakout session II - Assessing efficacy of responses: What to measure? How to measure? Who does the measuring? Confidence in measure?	Small groups
2:15	Break	
2:25	Breakout reports	Large group
3:15	Outstanding issues and questions	Abercrombie
3:30	Review DRAFT table	Abercrombie
4:00	Next steps and Adjourn	Abercrombie

Appendix II

Guidelines for facilitators chairing small topic groups

CWD Workshop
August 8 and 9, 2008
Edmonton

- Remind them that this topic group is meant to create information and provide guidelines. No hard and fast policy/decisions need to be made today.
- Some of your group may feel shy about contributing because they do not know as much about the topic as you do: try to encourage quiet participants.
- Never dismiss a contribution. If one of your group makes a suggestion that you know will not work, keep it anyway. This is just the beginning of the process and unworkable suggestions can be caught later.
- If people in your group do not agree, simply record the differing opinions and move on. The final document must describe areas of contention.
- Please remind your group that they do not have to think of everything today. If something occurs to them later, they have another kick at the can when participants review the draft document.

Appendix III: Tabular Summary of the CWD Workshop results, August 2008, Edmonton Alberta.

	Enzootic	Newly Detected	AT Risk
B-1.1 Question/Topic eradication or control?	Eradication unrealistic with current tools	Risk Assessment is critical	Develop Risk Management Strategy
	Control options range from limiting spread to documenting expansion (more info in text)	Intensive surveillance essential	Emphasize structured surveillance plan
	Conduct risk assessment *Document & measure spread	Implement prevention measures Assess source of infection	Develop Risk Avoidance Measures
Recommendations to consider	Limit carcass movements across enzootic boundaries Limit live cervid movement across enzootic boundaries Enforce game farm regulations Ban baiting and suppl. feeding of wild cervids *Determine acceptable level of CWD	If good surveillance & early detection, consider eradication goal If not, consider limiting further spread Assess CWD geographic distribution, pattern of occurrence, species involved Assess specific infection parameters reflecting individual exposure risk	Emphasize measures to prevent introduction Implement intensive surveillance Consider movement restrictions on live cervids and dead parts.
B-2.1 what to measure?	Measure deer density, sex/age distributions, mobility of local populations Consider sample size, time frame, geographic distribution Document road kill rate, CWD incidence, & regulatory compliance in relation to management activities Changes in disease prevalence & distribution	Document & measure possible spread Extent of public relations effort, level of public buy-in Evaluate stakeholder awareness Monitor hunter licence sales Assess enforcement rules already in place	Focus on assessing success of information and validity of surveillance programs Assess compliance with movement restrictions

how to measure?	Use prevalence to reflect changing disease dynamics	Use incidence (# new cases over time) or prevalence (% positive)	Use surveys, staff contacts, & stakeholder feedback to evaluate I&E programs Review surveillance criteria and results
	Use prevalence to evaluate effects of response program	Use spread as indicator of program success	
who measures? level of confidence?	In all risk categories: agency with greatest funds and political support. Should be done in consultation with experts All risk categories: measures will reflect detection level of ongoing surveillance. Confidence improved with larger samples size.		
B-1.2 disease ecology	<p>Reduce deer population density</p> <p>Reduce environmental contamination Reduce deer dispersion</p> <p>Improve disease surveillance, particularly in new areas Reduce carcass movement</p> <p>Improve carcass disposal (wild & farm)</p> <p>Eliminate feeding & baiting Integrate research, surveillance, & management Regulate movement (wild & farm) Regulate movement of cervid feed Focus on peripheral areas</p>	<p>Reduce local deer populations</p> <p>Focus on hot spots (sparks) Control feeding & baiting</p> <p>Control movement (wild & farm)</p> <p>Prevent movement of CWD risk materials</p>	<p>Focus on areas closest to known CWD risk Restrict live cervid imports Discourage artificial concentrations of cervids Assess natural cervid movement patterns Consider preventative population reduction in potential risk areas Regional coordination & integrated planning strongly advised</p>
B-2.2 what to measure?	<p>Changes in pop'n density</p> <p>Cumulative # CWD cases</p> <p># cases/# tested</p> <p>Density of cases</p>	<p>Localized population reduction</p> <p># of infected animals removed</p> <p>Ongoing evaluation of surveillance plan</p> <p>Understand species distribution & natural movement patterns</p>	<p>Structured surveillance driven by proximity to risk Regulatory compliance of disease controls e.g., feeding & baiting Assess I&E extent and effectiveness in informing audience Distance to known risk</p>

Density of new cases

Success of regional cooperation (as evidenced in response & contingency plans)

Ongoing evaluation of changes over time.
 Randomized consistent surveillance
 Compliance with disease control regulations (track violations)
 Research to inform improved Risk Assessments. E.g., deer movement & genetics, ongoing/changing disease measures, predictive measures,

how to measure?

All areas: movement studies (radio collars) & population genetics can reflect deer movements
 # cases per time unit or per geographic unit can reflect whether control is effective

B-1.3 Role of Hunters in Various CWD Management Activities

Management Activity	Enzootic	Newly Detected	At Risk
Surveillance	+++	+	++
Clinical Suspect Removal	++	+	+++
Deer Population Reduction	++	+	+
Deer Age/Sex Structure Change	+	++	+
Focal Area Deer Removal	limited	limited	limited
Carcass Movement Biosecurity	+++	+	++
Baiting Restrictions	+++	+++	+
Removal of Escaped Farmed Cervids	+	+	+

	+	somewhat useful
	++	useful
	+++	very useful
B-2.3	what to measure: surveillance	All areas: hunter harvest contributions in light of program objectives. Are objectives met? All areas: efficiency ... estimate # hunters per sample collected All areas: method ... determine whether voluntary or mandatory is needed to achieve objectives All areas: targeted clinical surveillance ... measure # hunters /clinical sample OR # contacts per submission over time
	what to measure: pop'n reduction/ management	Harvest numbers "Infected" areas: Cervid population estimates before & after management "Infected" areas: Cervid age/sex ratios (are they changing?) "Infected" areas: hunter effort/success (& is it changing?) All areas: include appropriate questions in hunter surveys
	what to measure: reducing risk	"Infected" areas: # of enforcement events "Infected" areas: tonnage of cervid waste at dumpsters "Infected" areas: query individual hunters re: carcass & offal disposal All areas: include appropriate questions in hunter surveys All areas: survey taxidermists regarding source of heads All areas: review agency export/import records in light of determining carcass movement
	what to measure: baiting	All areas: track # enforcement actions All areas: use aerial surveys to find bait/feeding sites All areas: monitor sale of bait/feeding items

B-1.4	carcass disposal	Reduce environmental contamination Consider restricting cervid offal on landscape	Avoid surface environmental contamination Cervid materials should go to approved landfills or deep burial Incinerate if only a few carcasses	Avoid infecting the environment Public education should promote safe disposal of cervid carcasses Ongoing reinforcement of messages Maintain interest with incentives
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carcass movement	Restrict transport OUT of enzootic areas	Apply import and export controls in risk areas	Import controls essential
orphan fawns/calves	Euthanize whenever possible	Euthanize as primary disease control	Prevention is the best protection!
	Foster using approved methods for release well into enzootic areas	Possible use of live animal test suitable to detect early infections	Foster & release if surveillance is sufficient to detect absence of CWD
	Never move into or out of enzootic areas	Do not move from CWD risk areas	Never accept cervids from CWD areas
B-2.4	what to measure	All areas: need to find surrogate measures of disposal, movement, and disposition Compliance with applicable restrictions or regulations Engage social science specialists to help monitor & predict human behaviours Monitor transportation corridors, dump sites, commercial offal operations & products	
	how to measure: disposal	Remote sensing?	
	how to measure: carcass movement	Tally passage through check stations, survey sites, checkstops Check with receiving destination Survey taxidermists & meat processors Surveillance at dump sites & transportation corridors	
B-1.5	targeted herd reduction: when to use	general info applicable to all risk regions Stamp out around isolated cases. E.g., first case or distant spark Reduce spread in Newly Detected area OR on enzootic peripheries (?) Ongoing monitoring in CWD risk areas Address specific public perception of need to manage CWD. Increases program awareness and validation.	
	things to consider	Primary species involved Focused removal of migratory species/population? Local geography and habitats in light of agency resources Animal density and probability of disease spread Pre-removal density in target area; rate of repopulation Size of removal area Public perception & power to affect agency decisions/programs Land ownership patterns Overall feasibility of successful density reduction Design with suitable measurement capacity, long-term follow up, and adaptive improvements	

		Integrate with suitable research to inform management improvements		
	how to deliver	Monitor predators to find 'sick' deer Introduce alternate limiting disease e.g. EHD???		
		Use targeted hunters with dogs Various forms of agency sharpshooters Apply reproductive controls/contraceptives Assess acceptance of other methods such as snares, poison.		
	risk area specific information	Change hunting rules in CWD areas. Consider spotlighting, shooting from roads, baiting in conjunction with directed removal. Reduce likelihood of sparks & reduce peripheral spread Ring culling to reduce risk around affected core & buffer adjacent locales Hot-spot culling in areas of high occurrence Reduce genetically predisposed populations	Use in light of program goals and objectives Slow further incursions from adjacent enzootic areas Keep CWD out of unaffected areas Limit probability of CWD establishing or spreading	Include in contingency plans & management scenarios Begin dialogue with stakeholders & publics
B-2.5	[Editors note: in Session b, Groups 5 and 8 joined together. See information provided under B-2.8	Reduce local transmission rates Reduce environmental contamination	Address sparks, establish buffers, Reduce environmental contamination	
B-1.6	novel interventions (such as test & remove)	Questionable value in enzootic area Little impact over long term Effects swamped by environmental contamination	Immediate response is essential Targeted removal can be very effective Direct approach needed to change disease dynamics when occurrence is limited Requires suitable surveillance & management Needs time to see effects	Not applicable Increased predation may limit cervid populations and reduce disease risk
B-2.6	what to measure	Distribution of peripheral CWD cases Speed at which CWD is moving Extent of predation	Combine with suitable research CWD prevalence, incidence, distribution Population at risk	Not applicable

	<p>Rate of positives in animals removed Refine measures of CWD occurrence Establish appropriate time frame: 5yr?20yr? Test large sample periodically rather than ongoing smaller samples Live recapture combined with live test</p>	<p>Establish time frame: 5yr?10yr?20yr? Define size of affected area, habitat suitability for cervids, species involved Sentinel herds with different management Predator scat analysis for prions(?)</p>	
B-1.7 B2.7	<p>[Editor's note: the original item 7 was considered an overlap with other topics and was not addressed]</p>		
B-1.8	<p>manipulating deer density: general info applicable to all risk regions</p>		
	<p>Good response tool based on broad disease theory Needs careful thought and design in context of long-term research & adaptive management Management should occur in interim as research provides ongoing input Design should include manipulating density & contact rate, controls, multiple locations, population age structure and sex ratios Must reflect public acceptance and include extensive public input and education</p>		
risk area specific information	<p>Options range from no manipulation in core to extensive action on periphery</p>	<p>Density manipulation recommended Need targeted surveillance Need baseline prevalence/occurrence</p>	<p>Consider factors of disease occurrence & spread relative to distance to CWD Establish regional cooperation & plan Work towards cervid population goals</p>
B-2.8	<p>what to measure</p> <p>Prevalence Force of infection Incidence Change in # of cases</p>	<p>Prevalence Force of infection Incidence Change in # of cases</p>	
B-1.9	<p>public/political support: general info applicable to all risk regions</p> <p>Essential to develop & deliver ongoing effective communication Message should be clear & consistent within and among agencies and across disciplines Be proactive Avoid message fatigue</p>		

		Build solidarity among agencies to expand public trust Be inclusive of all stakeholders Be transparent with all stakeholders Adapt the communication plan to new info Refresh messages regularly Encourage stakeholder input & feedback Engage professionals? Avoid staff burnout		
	risk area specific information	Communication remains important Consolidated consistent messages Determine interagency authorities	Good ongoing broad communication is essential Consolidated consistent messages Determine interagency authorities	Start by engaging stakeholders in honest & open dialogue Discuss actions to follow first case Develop socio-economic analyses of contingency plans
B-2.9	what to measure: all risk regions	Delivery & comprehension of messages - awareness and implementation Success in reaching communication objectives Acceptance of programs Social & behavioural changes in response to messages Achieving milestones: political, public, stakeholders		
	how to measure: all regions	Polls, surveys, media scans, feedback forms, correspondence, public meetings, human dimension studies, peer review Use milestones Funding levels, evaluations, leverage points, changes in policy,		