
Alberta Chronic Wasting Disease Management

Program Review Panel Report

(Peer Review)

February 2008

Executive Summary Including Key Observations and Recommendations

This report summarizes the work of an Alberta Chronic Wasting Disease (CWD) Management Program Review Panel. The Panel was convened in Fall 2007 to review Alberta's past and current CWD surveillance and response strategies and efforts for wild deer and to provide recommendations to improve ongoing provincial wild deer CWD management. Based on written and verbal information shared by the Fish and Wildlife Division of Alberta Sustainable Resource Development (FWD), the Panel considered the province's CWD surveillance efforts since surveillance was initiated and then expanded when CWD was documented in wild deer in Saskatchewan in 2001 (a hunter-killed deer shot in November 2000) and in 2 Albertan cervid farms in 2002 (1 elk farm, 1 deer farm), as well as provincial CWD control efforts that began in response to the first identification of CWD in a wild Alberta deer in 2005. The Program Review Panel commends Alberta, including all cooperating agencies, landowners, hunters, and others for their efforts to date on CWD management.

The Program Review Panel believes that, if the current underlying assumptions regarding the presence of CWD in Alberta are true then the situation in Alberta is one that lends itself to the possibility of success in controlling the westward spread of CWD into new areas in the province, as well as providing an opportunity to explore novel approaches for CWD control that have not yet been attempted elsewhere.

Summarized below are the key observations arising from the program review, as well as recommendations for Alberta to consider in formulating the province's ongoing approach for CWD management.

Key Observations of the Review Panel

Background and Underlying Assumptions

- The underlying assumptions upon which Alberta's Chronic Wasting Disease Control Strategy are based, appear to be reasonable and based on best available science.
- CWD appears to be established in eastern Alberta (and adjacent western Saskatchewan) in free-ranging deer populations.
- Alberta's ongoing CWD management must be designed and implemented taking into account neighboring Saskatchewan's evolving approach to management of CWD in wildlife.

Surveillance Program/Identification of Risk Areas

- CWD surveillance has been ongoing in Alberta at some level for over a decade and Alberta has made a reasonable effort to understand distribution of CWD within the province. However, additional attention should be given to collection, organization and analysis of past, current and future surveillance data.

Management Goals, Policies, Strategies, & Alternatives

- Based on the information currently available, the Review Panel believes that eradication (i.e., complete elimination) of CWD from Alberta is not likely to be feasible, but that control of CWD spread may be achievable. We think that to increase the likelihood of successful control it will be important for Alberta

to pay particular attention to deer biology, disease ecology and landscape factors in the Alberta/Saskatchewan border area.

- Alberta has already put into place measures designed to prevent additional introductions and establishment of CWD in the province. However, continued vigilance and ongoing re-evaluation of introduction risk management strategies is critical.
- Alberta has demonstrated the ability to mobilize intensified hunting and government culling to remove deer from areas where population reduction is desired as part of the disease response objectives. However, based on the information provided to the Review Panel, the amount of progress made toward meaningful population reduction is unclear and may be limited.
- In light of myriad uncertainties, regular re-evaluation of management goals, strategies, and practices on a 5 year basis appears to be a reasonable approach.

Research

- Research planned and underway appears to be directed toward answering questions important to improving understanding of CWD biology and control in Alberta.

Education and Communication

- Alberta has clearly invested considerable effort to this point in education and communication in order to attain their management goals. However, because stakeholder attitudes may change as CWD management continues, ongoing province-wide education and communication will remain critical.

Other Considerations

- It appears that there is a high degree of cooperation in Alberta between Alberta Agriculture and Food (AFD) and the Fish and Wildlife Division of Alberta Sustainable Resources Development in the development of CWD surveillance and management programs for the farmed and wild cervids regulated by the two agencies. We believe this approach is essential to successful control of CWD in both populations.

Key Recommendations

Surveillance Program/Identification of Risk Areas

- We encourage Alberta to continue to emphasize identification and testing of CWD clinical suspects (“targeted surveillance”) as the foundation for broadly assessing CWD distribution in Alberta. However, surveillance data need to be tracked so that the distribution and numbers of such animals tested can be documented
- As new information on options for design and analysis of CWD surveillance programs becomes available, surveillance strategies should be adjusted to attain the most economical and efficient surveillance program to meet the provincial goals for disease detection and monitoring.
- The adequacy of geographic coverage, and therefore detection certainty, of past surveillance needs to be evaluated and areas that have been incompletely surveyed need to be addressed.
- Alberta is currently concentrating much of its surveillance effort in areas where CWD is already known to exist. We suggest that it is important to intensify surveillance in the wintering habitat and riparian areas that provide likely corridors of spread in order to gain assurance that the leading edges of the areas of infection truly have been identified. We recommend more extensive westward surveillance of deer winter ranges also as a basis for assessing the long-term effectiveness of intensive CWD management actions undertaken in the eastern part of the province.
- CWD surveillance efforts would benefit from a more organized and complete compilation and analysis of existing data, as well as from additional planning for gathering and analyzing future data. We encourage these refinements be done relatively soon in order to make best use of both past data and

data generated over the next few years in planned 5-year assessments of ongoing management practices.

Management Goals, Policies, Strategies, & Alternatives

- Experiences in other CWD affected jurisdictions suggest that Alberta may want to assess whether disease eradication is an appropriate ultimate objective. This re-assessment should include consideration of not only the biological issues, but also the political and social realities that will impact that long term choice.
- If Alberta concludes that CWD control/containment is the goal, we recommend that concrete objectives be formulated for levels and distribution of CWD that will be accepted. It is important for all stakeholders to realize that intensive, costly, and creative biologically and socially based strategies are not exclusive to the eradication option and still will be needed for an effective campaign to achieve containment.
- We recommend that Alberta periodically re-evaluate possible risk factors for additional introductions of CWD into the province. One current factor that we suggest should be addressed is the issue of proper carcass disposal province-wide. Proper disposal of carcasses should be emphasized regardless of the source of the harvested animal. This can be accomplished via enhanced hunter, processor and taxidermist education.
- We recommend that Alberta retain the option of using government culling as part of herd reduction strategies because hunter harvest is not likely to be sufficient to achieve CWD control objectives.
- Careful consideration should be given to the size of the action areas when new positive animals are identified. The more the geographic distribution of CWD can be defined based on biological rationales (i.e. targeting animals that are at highest risk of transmission from the new positive animal(s) detected), the more effective those actions likely will be from a disease control perspective and the more acceptable they may be to stakeholders over the long term.
- Deer densities and landscape features of eastern Alberta may allow the consideration of novel approaches for control and containment of CWD. We encourage Alberta to consider such approaches.
- Regardless of the management options chosen, surveillance and research designed to objectively measure the effects of management actions are critical.

Research

- We recommend that Alberta organize past and current surveillance data for analysis of disease detection probability and for design of ongoing surveillance strategies.
- We recommend that Alberta consider an experimental design in their management approaches to optimally measure control efficacy.
- We suggest Alberta continue to choose research collaborations in light of priorities for provincial CWD prion management.

Education and Communication

- We recommend that Alberta continue their commitment to support a high level of proactive communication and transparency over time with the general public, special interest groups, local affected communities, and affected agricultural producers/landowners.
- Insure that dialogues with stakeholders are truly a two way conversation assuring that both sides understand what the other is attempting to communicate and that stakeholders have a role in CWD management decision making.

Other Considerations

- We recommend that an external review of the AFD and FWD CWD farmed cervid industry programs be conducted in a similar manner to this one for the wild cervid programs. As we point out below, it is important to realize that the CWD issue is intertwined among farmed and wild cervids and addressing a control program for one population without including the other is counterproductive.

Introduction:

Since the implementation of ongoing chronic wasting disease (CWD) surveillance efforts in 1998, Alberta's CWD program has changed to meet the challenges presented by occurrences of CWD in both their farmed and wild cervid populations. The Fish and Wildlife Division of Alberta Sustainable Resource Development (FWD) launched surveillance and response programs upon the first detection of CWD in a wild mule deer in Saskatchewan in 2001. Efforts were amended and intensified with the discovery of CWD infected cervids in two Alberta game farms in 2002 and again upon discovery of a CWD positive wild doe in September 2005 near Oyen on the Alberta–Saskatchewan border. The ultimate objectives of Alberta's CWD control strategy and response program are to eradicate CWD from the province and to prevent future CWD introduction. Interim provincial objectives include the following: 1) Identify CWD occurrence in risk areas in Alberta; 2) Isolate and contain CWD within a minimal geographic area (prevent spread); 3) Eliminate CWD found in Alberta as soon as possible; and 4) Maintain public support for CWD control and deer management programs, as well as maximize deer hunting opportunities across Alberta.

Surveillance data gathered since 2000 suggest that CWD has become established in free-ranging deer populations in western Saskatchewan. CWD also is more widespread in Alberta than originally believed; the Albertan focus presently extends from roughly the Battle River to the South Saskatchewan River, and appears likely to be contiguous with infection in free-ranging deer in Saskatchewan. In October 2007, the FWD decided to seek an external peer review of Alberta's chronic wasting disease programs in wildlife. The goal was to gain an unbiased outside review of ongoing CWD surveillance and response programs in Alberta in the context of whether they were/are appropriate relative to the perceived risks to wild deer populations and likely to achieve sound deer management. Drs. Lynn Creekmore, Julie Langenberg, and Michael Miller were invited to serve on the peer review panel.

Charge to Review Panel

Our panel was asked to review past and current surveillance and response program strategies and resulting efforts and to provide recommendations to improve ongoing provincial CWD surveillance and response strategies in Alberta. We were asked to retain high-level general scoping of pros and cons of Alberta's approach where possible, rather than to provide a detailed review of program specifics. To help focus our assessments and provide specific input that would be particularly useful to program managers, a list of more specific questions was provided (Appendix A). In developing our report, we have included answers to these questions in the body of the review which follows.

To obtain necessary background information for conducting our review, we requested and subsequently used resources provided by FWD staff. This information included annual CWD surveillance and response reports and maps, national and provincial CWD control strategy documents, FWD and Alberta Agriculture and Food (AFD) websites, and technical information and data related to deer biology and management including maps depicting critical habitat and topographical information. FWD personnel did not participate directly in our review, but were available to answer specific questions throughout the review process.

Background and Underlying Assumptions

The specific questions provided by FWD staff included a request for our panel to assess the underlying assumptions upon which some key decisions were and are based. We applaud this request, as careful examination of such assumptions as well as clarification of goals and objectives are critical to providing a useful evaluation and recommendations for program improvements. The commitment of FWD to making sound policy and strategic decisions is clearly reflected in the guiding principles for the provincial CWD management strategy: Based in science; collaborative with landholders, stakeholders, disease experts, and other jurisdictions; strategic investment in long term security of deer and cervid-associated economic benefits; adaptive approach to develop and implement best management practices; transparent and cooperative communication. From our review, it is clear that these principles truly have and are guiding decision-making relative to CWD management in Alberta.

Current response strategies assume that CWD is not a natural component of native Albertan ecosystems and that if no attempt is made to eradicate or control CWD the disease will eventually spread throughout the province and likely have negative impacts on both wildlife and farmed cervids. We agree with these assumptions, although the rate and magnitude of the forecasted impacts on cervid populations is certainly not fully understood. However, both the economic impact analysis provided by FWD and the experience of other CWD-affected jurisdictions suggest possible long term economic costs associated with increased CWD infection and responsive management efforts. Consequently, we support Alberta's decision to implement a management plan in response to the detection of CWD in the province. Alberta's commitment to base their surveillance and response choices on the best available scientific information also is supported by the panel. The fact that FWD has requested the current peer review illustrates their dedication to this approach.

The current disease control strategy and early response documents state a goal of eradication of CWD from wild deer populations in Alberta. However, in specific questions posed to the panel there appears to be more emphasis on the use of current herd reduction approaches to limit spread and to manage or control the disease at the periphery of the two locations where clusters of CWD positive animals have been detected to date. It was our consensus that "eradication" means complete elimination of CWD in the Alberta deer populations. We define disease "control" as limiting the spread of CWD to new areas in Alberta and limiting prevalence of disease in the existing enzootic foci to a low level, but still accepting some level of disease occurrence. These definitions frame a distinction that should be kept in mind when these terms are encountered throughout the document. As requested, we have attempted to assess the validity of underlying assumptions and recommendations regarding eradication or control strategies. That being said, the ultimate goals and the appropriateness of Alberta's level of response to this disease are decisions that should be made by the people of Alberta, not our Panel.

Current surveillance and response strategies assume that free-ranging deer in Saskatchewan are the most likely source of CWD detected in wild deer in Alberta and that mule deer and white-tailed deer in areas in Alberta adjacent to known cases in Saskatchewan are at greatest risk of infection. We recognize that other cervid species (moose, elk, perhaps caribou) are also at some risk for CWD infection, but that at present affected free-ranging populations in the province primarily encompass the two deer species. We agree that current information supports the likelihood that infected deer populations in Saskatchewan were the source of infection for wild deer in eastern Alberta and that CWD spread naturally across the provincial border. However, the fact that new positive deer continue to be found with each new surveillance effort on the Alberta side of the border suggests that the disease has become established in deer in Alberta and that spread westward in Alberta in areas adjacent to those already infected is likely as well. In addition, we caution that identifying this tangible source of disease and a tangible risk that likely has led to the occurrence of CWD on the border does not negate the need to vigorously continue surveillance and risk assessment in the rest of the province. (We have learned this lesson the hard way in

several US jurisdictions.) It is important to note that Saskatchewan is addressing the presence of CWD in both their wild and farmed deer populations separately from Alberta, although we know communication and coordination between the provinces is ongoing. It is our understanding that Saskatchewan is currently revising and finalizing a new approach to CWD management that they hope to make available this year. Their decisions regarding the border area will be important to include in the data Alberta uses for their own decision making on disease response approaches.

Current strategies also assume that CWD is a relatively recent arrival in southeastern Alberta. We agree that this is a reasonable assumption based on the current data, but regard “recent” as still being perhaps a decade or more ago. However, we caution that it also is possible that surveillance efforts to date have not identified all affected areas and that future findings could lead to the conclusion that CWD has been present in Alberta for a longer period of time than currently assumed.

Surveillance Program/Identification of Risk Areas

Surveillance is an important tool for both detecting new CWD foci and for assessing changes in distribution and prevalence in response to management. Although CWD surveillance has been ongoing in Alberta at some level for over a decade, the effort has not been sufficiently uniform in either time or space to likely provide a comprehensive picture of true distribution or of prevalence trends. This criticism is not unique to Alberta – we know of no jurisdiction where comprehensive CWD surveillance had been conducted prior to discovery of one or more cases within that jurisdiction. However, in light of the interim objectives for controlling CWD within Alberta, modifications in surveillance practices and use of resulting data may be beneficial.

Surveillance methods

A more complete understanding of CWD distribution in Alberta is essential to assessing the effectiveness of management practices intended to minimize geographic spread. If CWD already occurs more widely than presently believed, then subsequent “discovery” of preexisting foci could lead managers to underestimate the efficacy of their practices; alternatively, if surveillance to detect new foci is inadequate, then the failure to detect new foci could lead managers to overestimate the efficacy of their actions. Experiences from several North American jurisdictions have shown that collecting and examining cervids displaying clinical signs suggestive of CWD (often called “targeted” or “clinical” surveillance) is an effective foundation for surveillance designed to detect new disease foci. The utility of this approach already has been borne out in Alberta – the first free-ranging CWD case detected in the province was in a clinically ill animal found outside the areas identified for intensive surveillance via agency-sponsored culling based on contemporary beliefs about risk. Consequently, we encourage emphasizing “targeted surveillance” as the foundation for broadly assessing and monitoring CWD distribution in Alberta. We were not able to readily assess the extent to which targeted surveillance has contributed to overall surveillance efforts in Alberta to date, but recommend that this approach be reemphasized province-wide; such an approach might be facilitated by public outreach and establishment of biologically relevant quota systems to guide managers in meeting surveillance goals. Based on experiences elsewhere, high-risk subpopulations that may be most useful in detecting new CWD foci include clinically ill adult (> 2 years old) deer (and elk), “found dead” animals, vehicle- and predator-killed adult deer (particularly males), and prime aged (4–6 years old) male deer killed by hunters. We further recommend that sources of submissions (e.g., “suspect”, harvest, cull, vehicle-kill, predator kill) be noted for all samples (prospectively and, where possible, retrospectively) to better allow for assimilation and interpretation of surveillance data (see further discussion on this topic below).

Collecting and examining random samples of populations through harvest or culling also has utility in estimating and monitoring CWD distribution and prevalence. However, because deer population biology is complex and CWD is relative rare and spatially heterogeneous, some care should be

exercised in collecting and interpreting data from these “random” sampling approaches. Although sample sizes were relatively large in some “Wildlife Management Units” (WMUs), we were not able to readily assess the effectiveness of harvest-based surveillance at either provincial or more local scales; we recommend that the data and analysis necessary to evaluate the probability of CWD detection be included in the future surveillance plan. Ongoing Albertan studies designed to better understand connectivity and develop population genetics tools to aid in defining biologically relevant deer “population units” may help provide a framework for future surveillance efforts and for interpreting historical activities; based on experiences elsewhere, such a framework may be an improvement over the use of WMUs as the geographic units for surveillance. CWD surveillance in Alberta will be an ongoing need in light of the expressed provincial goals for its control, but trends in other jurisdictions suggest that at some point in time managers will inevitably face limitations on the resources available for surveillance. Consequently, we believe it important for Alberta to make best use of recent and future findings from work elsewhere that is focused on developing approaches for more efficiently detecting and monitoring CWD at low prevalence.

Geographic distribution of surveillance efforts

Based on the information provided, we believe that there may be some merit in further assessing the geographic distribution of past CWD surveillance efforts within Alberta and perhaps modifying future efforts in light of that assessment to provide a more complete understanding of overall distribution and of changes (or lack thereof) in distribution in the face of ongoing disease control programs. Some information already is available for assessing historical efforts, but further breakdown of data by sample source, geographic area (WMU or other representative landscape unit), and year should afford managers a more detailed basis for reviewing past surveillance throughout the province and identifying potential gaps that may need to be filled in the near future. Such a breakdown also would allow managers to better estimate the probability of and confidence in detecting new foci (at some *a priori* prevalence) within individual WMUs or among biologically relevant collections of WMUs.

It is clear from the materials provided for our review that the geographic emphasis of historical CWD surveillance in Alberta has been influenced to a large extent by perceptions about potential sources of infection and exposure risks. Risk-based approaches are used widely to guide surveillance designed to search for foci of CWD and other diseases, particularly where resources to support surveillance are limited. In light of the interim management goals and expressed desire to limit the spread of CWD in Alberta, however, future efforts to monitor and manage CWD may benefit from some refinement of these approaches. We were unable to fully assess the geographic distribution of existing surveillance data in the absence of geo-referenced points for both positive and negative deer that have been sampled, but the information provided suggested that the vast majority of sampling has occurred in WMUs where CWD already is known to occur, and that within those WMUs much of the sampling has been focused within 10 km of detected cases. However, our review of the information provided also suggested that in eastern Alberta CWD foci are strongly associated with riparian corridors and deer winter ranges. It follows from that relationship that more extensive westward surveillance of deer winter ranges associated with the Battle, Red Deer, South Saskatchewan, and other appropriate border area rivers (as was started in winter 2006) would provide a more complete snapshot of CWD distribution in those drainages as well as a basis for assessing the long-term effectiveness of intensive CWD management actions undertaken in the eastern part of the province. In contemplating how best to achieve surveillance goals in a timely fashion, the relative strengths and weaknesses of voluntary and mandatory harvest submissions as well as agency culling should be considered.

In addition to surveillance based on risks from free-ranging foci both within and outside Alberta, past experience in Saskatchewan and several states suggests some level of surveillance in the vicinity of farmed cervid facilities would be prudent. Given the abundance and wide distribution of such facilities in Alberta, some combination of redoubled emphasis on farmed cervid surveillance and targeted surveillance in the vicinity of these facilities might present a cost-effective strategy for this facet of surveillance.

Organizing, analyzing, and interpreting surveillance data

As Alberta continues its attempts to manage CWD, monitoring progress and detecting setbacks will be critical components of the adaptive approach advocated in provincial strategies. In this context, CWD surveillance and management efforts likely would benefit from an even more organized and complete compilation and analysis of existing data, as well as from additional planning for gathering and organizing future data. Essential data elements for *all* samples collected in the course of surveillance and management should include the species, gender, age (or age class), source of the submission (e.g., “suspect”, “found dead”, harvest, cull, vehicle-kill, predator kill), the geographic origin (preferably UTM coordinates, but minimally approximate map locations within a WMU or other representative landscape unit), collection date, and testing details including tissue type, assay method and result. Once compiled, plotting surveillance data may be useful in identifying both disease clusters and gaps in sampling efforts, especially where it is possible to assess surveillance in the context of deer density and deer habitat data. Further analysis of these data also may provide insights into epidemic dynamics and potential duration of identified foci. If not readily available within Alberta, examples of systems for acquiring, assembling, and analyzing these data likely would be shared by other jurisdictions with experience in CWD surveillance. We encourage these refinements to be done relatively soon in order to make best use of both past data and data generated over the next few years in planned 5-year assessments of ongoing management practices.

CWD Control/Management Goals, Policies, Strategies, & Alternatives

We considered Alberta’s CWD program in the context of both the Alberta CWD Control Strategy (August 9, 2007) (Appendix B) and Canada’s National CWD Control Strategy. The provincial control strategy identifies as its ultimate objectives eradication of CWD from Alberta and prevention of its future [further] introduction. Embracing disease eradication as the ultimate provincial objective is laudable and compatible with the viewpoint that CWD is a disease foreign to Alberta’s native ecosystems. However, given what has been learned in the Canadian provinces and other North American jurisdictions over the last 5 years about the difficulties of controlling CWD spread and persistence in wild cervid populations, and given the extent of CWD in free-ranging deer populations in western Saskatchewan, disease eradication may be an unrealistic goal and we doubt that it can be achieved in this situation with existing management tools. Experiences elsewhere suggest that Albertans may want to reassess whether disease eradication is an appropriate or necessary ultimate objective, given the current lack of proven CWD eradication or control strategies and absence of likely natural or anthropogenic barriers corresponding to the arbitrary jurisdictional border between the provinces. In reality, it appears to us that either eradication or control will be “forever” tasks, given the extent to which CWD appears to be established in Saskatchewan. Adopting a provincial goal of effectively controlling and managing CWD in place of eradication still would be in keeping with the goals and philosophies outlined in Canada’s National CWD Control Strategy. Any reassessment of Alberta’s ultimate goals for addressing CWD should include consideration of not only biological issues, but also the political and social realities that undoubtedly will impact that long-term choice.

We also considered the prevention and interim objectives identified in the Alberta CWD Control Strategy, specifically those related to controlling CWD:

- Isolate and contain CWD within a minimal geographic area (prevent spread).
- Eliminate CWD found in Alberta as soon as possible.
- Maintain public support for CWD control and deer management programs, as well as maximize deer hunting opportunities across Alberta.

Alberta has identified the prevention of future/further introductions of CWD as a key priority. This includes both actions to prevent continued spread of CWD across the border from infected

populations in Saskatchewan, but also programs to prevent introduction from other potential sources (e.g., farmed cervids, human influenced animal movements, baiting and feeding of wildlife, and carcasses inappropriately discarded on the landscape). Alberta has implemented both national and provincial plans for CWD monitoring and prevention in farmed cervids. Part of this program includes restriction on movements of farmed cervids into Alberta. A complete moratorium on imports of live farmed cervids was in place from 1987 to 2004. After that time, a limited number of imports of live cervids from other Canadian provinces were allowed under very restrictive protocols. As a result, the only farmed cervid imports that have occurred since 2004 are animals that were imported directly to slaughter. Additionally, moving live cervids of free-ranging origin into farms and into or out of the provincial border area is illegal. Prospects for success in achieving the stated interim objectives are greatly enhanced because baiting of deer for hunting purposes and winter feeding of deer are either illegal or contrary to current policy in Alberta. From the materials provided, it is not clear whether Alberta is considering restrictions on movement/disposal of cervid carcasses. At minimum, we recommend enhanced hunter, game meat processor, and taxidermist education on safe carcass disposal practices for the entire province. In our experience, there is no substitute for disease prevention as a strategy for managing disease in populations.

Given the likely persistence of CWD infection in wild cervid populations in Saskatchewan, Alberta may need to consider whether containment of CWD in a provincial border zone is a more realistic CWD management objective than eradication. Regardless of the ultimate goal chosen, intensive, creative, and probably expensive biologically- and socially-based strategies still will be needed to mount an effective campaign to achieve containment. Possible components of such a strategy could include:

- An action area encompassing hundreds of kilometers along the border, stretching from the North Saskatchewan River south some biologically relevant distance beyond the South Saskatchewan River. Though action areas for intense population reduction and intense surveillance might be significantly smaller (e.g., selected riparian corridors), it is arguable that significant population reduction would be indicated across the entire area.
- Significant population reduction and surveillance west of the known CWD-affected border area – an action area at the “western front” of the CWD area, to attempt to reduce transmission and geographic spread by reducing density of susceptible deer.
- Research to identify key deer movement corridors in the border area, to be used to identify focused areas for severe deer population reduction and disease surveillance. This research could include telemetry studies, but also landscape genetic work to identify existing population corridors and patterns of connectivity.
- The possibility of using additional tools to remove deer or prevent deer movement from the border area, e.g. “traps” in riparian movement corridors to collect/enhance removal of infected deer, fences across key movement corridors, etc.

It is not clear whether CWD can be contained to the Saskatchewan–Alberta border area. However, this objective may be a more realistic step towards protecting Alberta’s important intermountain wild cervid populations from CWD and also the province’s farmed cervid populations.

The Albertan plan to reduce the risk of further CWD spread across the border and to limit spread in areas where CWD already exists in Alberta has and likely will continue to focus on deer herd reduction. The control plan indicates that herd reduction is to be achieved through “...aggressive harvest by recreational hunters combined with targeted removal of deer.” The selection of herd reduction to attempt to control CWD spread seems appropriate in view of the current knowledge of CWD and the management of disease in free-ranging wildlife, and consistent with Canada’s National CWD Control Strategy. However, there is only limited information yet available supporting the notion that the spread of CWD in wild deer populations can be impacted by herd reduction efforts. Both Colorado and Wisconsin preliminary data suggest that it is possible that the rate of increase of prevalence may have been suppressed through deer population reduction, but such outcomes are far from suggesting that disease control or eradication can be accomplished through

these approaches. Certainly, the success of deer population reduction as a CWD control strategy is not guaranteed. However, the lack of proof cannot be used to justify inaction by agencies charged with conserving valuable natural resources: Increased infection rates and geographic spread of CWD are the anticipated consequences without a control effort. Additionally, the applications of CWD control tools that may be developed in the distant future (e.g., vaccination, targeted identification and culling of only CWD positive deer) will be much easier with lower density deer populations and geographically smaller endemic foci of CWD.

Alberta's herd reduction plan was designed to handle different levels of assessed risk with different approaches to herd reduction:

- For large areas of potential risk of CWD introduction and spread (e.g. the eastern Alberta border area), "general lowering of deer density".
- Where a new CWD case is detected, "elimination of deer in a 10 km circle".
- For areas where clusters of CWD cases have been detected and CWD is considered established, reduction of deer density "to <1 deer/km²".

In general, these strategies are supported by current knowledge of CWD and general wildlife disease management principles. The scientific basis for the specific choices for the area of culling action is less strong, though studies in some CWD-affected areas in the US do suggest highest risk of CWD transmission within a relatively small area (2–3 km radius). As Alberta reassesses their CWD objectives and strategies in the border area, there also will be a need to reassess where and at what scale herd reduction strategies should be enacted.

It is apparent that FWD has instituted programs under all 3 of the herd reduction strategies listed above, using both enhanced hunter harvest and government culling. It was difficult to evaluate the amount of progress over the last 3 years towards the goal of significant deer population reduction in any of the areas where these strategies have been initiated based only on the deer removal and historical deer population estimates provided. However, to maximize success at what is a very difficult task, we recommend:

1. Choosing appropriate, deer biology-based action areas to maximize the efficacy of deer removal to meet CWD control goals. For example, where new, isolated CWD cases are identified, culling response should be focused on the population most likely at risk for transmission, using knowledge of deer home range, seasonal movement patterns, etc.
2. Regularly monitoring deer population numbers in the action areas chosen to maximize the potential to measure progress towards deer population reduction goals.
3. Continue using government culling to augment hunter contributions to deer herd reduction, especially in areas where hunting pressure is limited and in areas identified as of greatest importance for rapid herd reduction (e.g., winter concentration areas in riparian corridors).

The focus of Alberta's CWD control strategy has been on reducing deer populations to lower local deer densities in the hopes of eliminating groups of infected animals and interrupting prion transmission. Although we understand the basis for this approach and the underlying assumptions, we are not aware of data that either strongly support or refute the efficacy of these practices. Consequently, we believe the control measures described in the Alberta CWD Control Strategy should be implemented in a manner that allows for regular assessment of effectiveness. Because many of the assumptions about this approach involve altering deer density, we view the ability to measure changes in "effective" deer densities (defined here as the number of deer per km² of usable habitat, particularly winter range) as critical to this endeavor. We were pleased to see that FWD staff has recent historical data on deer densities in affected WMUs that can serve as basis for comparisons to assess the success of management actions in lowering densities. In light of the investment in control program activities, we encourage managers to continue making these measurements, and to perhaps consider a more standardized sampling framework for counting deer and estimating densities in critical habitats (e.g., winter range). From the information provided, it appears that deer densities in many of the "at risk" WMUs already are relatively low

(<1–2 deer/ km²), although it was unclear to us whether these estimates represented overall densities (i.e., number of deer per km² of land within the WMU) or effective densities. It follows that careful measurements of both density and disease occurrence may provide data that can be used to further test contemporary assumptions about threshold densities (e.g., <1%, as advocated in the National CWD Control Strategy) for CWD persistence in free-ranging deer populations. In addition to the present focus on affected WMUs, managers should consider expanding inventory efforts along at-risk riparian corridors (e.g., the Battle, Red Deer, and South Saskatchewan Rivers) to provide a more comprehensive picture of the potential for westward spread and to perhaps help guide surveillance and preemptive control strategies. Regarding the latter, it was unclear to us whether the present control strategy includes plans for geographically broader reductions of deer numbers in prairie and parkland habitats west of the affected border WMUs, but the costs and benefits of a more extensive attempt to reduce deer numbers in the hopes of lowering the probability of geographic spread and establishment of CWD foci deeper in Alberta may merit consideration.

Beyond traditional approaches, we recommend considering novel strategies that could augment or complement ongoing control measures. In this regard, managers may want to contemplate ways of fostering “environmental resistance” to persistence and/or abundance of deer in eastern Alberta. Elements of such resistance might include encouragement of natural predators and habitat modifications. In addition to actions that rely on killing deer to affect disease control, managers may want to consider strategies for habitat manipulations that could either reduce or enhance attractiveness for deer in order to either discourage or shift their congregation on relatively small patches of landscape. One example could be fencing of targeted migration corridors, either to discourage use, divert animals to alternate sites, or to concentrate animals for culling. We are not aware of attempts elsewhere to modify habitats as part of a CWD control strategy, so such an approach, if properly undertaken and monitored, could provide helpful insights into whether habitat management could be used to augment CWD control strategies in other jurisdictions. Because the present focus spans the provincial border, joint discussions of these approaches with Saskatchewan officials in the context of altering seasonal deer movement patterns also may be beneficial. Further, we encourage that incorporation of novel management approaches be done in an adaptive framework that will provide rigorous assessment of such approaches for potential application elsewhere in Alberta and beyond.

Because CWD control in wild cervids must be regarded as experimental, acquiring and analyzing data during control efforts are critical to measuring the progress of the program and to adapting strategies to maximize the effectiveness of CWD management. A 5-year timeframe for initial implementation and evaluation of chosen CWD control efforts is optimistic, but it may be possible to gain some preliminary insights into management effects (or lack thereof) during this time period. However, to have a chance at detecting an effect, it is critical that data collection and analysis plans be rigorously designed and applied, as described in greater detail in the surveillance section above.

Education/Communication

Education and communication to stakeholder groups and the public at large is critical to their understanding and support of surveillance and response activities. Based on the resources provided to us, FWD has strived to provide information via their website, direct communications and various other routes to hunters, landowners and other stakeholders. We recommend that FWD continue their commitment to support this level of communication and transparency over time. In other North American jurisdictions, a high level of support is seen early as surveillance and response activities are initiated in response to detection of CWD. However, this response often wanes over time when immediate positive results aren't evident and stakeholders realize that large, long term efforts and investments are required. Additionally, there may be less stakeholder support for deer population reduction efforts in areas “ahead of the front”. Also, stakeholder attitudes will vary between the currently affected areas and other, “non affected”, areas of the province; however, education efforts should occur province-wide and include all who have a stake

over the long term. The importance of maintaining an ongoing dialog with stakeholders, including public opinion surveys, is key in ensuring that communication and education efforts are effective in providing the information the public needs to accurately understand the issue. This also will be useful for recognizing and considering changes in public attitudes important to CWD management success.

A stated interim objective for CWD management in Alberta is to “maintain public support for CWD control and deer management programs, as well as maximize deer hunting opportunities across Alberta”. While a core motivation for CWD control clearly is to have optimal deer hunting opportunities across Alberta for the long-term future, FWD should consider somehow incorporating into their education/communication campaigns the unfortunate fact that near-term hunting opportunities in some areas of eastern Alberta may need to be sacrificed for this ultimate goal.

Research

It is apparent from our review that Alberta remains committed to generating new knowledge about CWD and its management, and that investigations within the province are being done in concert with other ongoing prion research occurring at various universities and research institutes in Canada and the US. The FWD remains connected to the national and international CWD research network and benefits from the results and information shared among its participants; it will be important to continue to use the results of these investigations to optimize Alberta CWD surveillance and control efforts. Locally, the Alberta Prion Research Institute set up by Alberta Ingenuity receives applications for a wide range of research topics, including various aspects of CWD. The FWD and the University of Alberta conduct cooperative research to inform adaptive management processes and improve provincial CWD programs. Where possible, supplemental samples and/or data collected during herd reduction programs are provided for research use; FWD should prioritize those collaborations of highest likely application to provincial CWD management challenges. It will be critical for Alberta to maintain opportunities to share information and research activities with Saskatchewan Environment to foster joint management of CWD in the border area.

Other Considerations

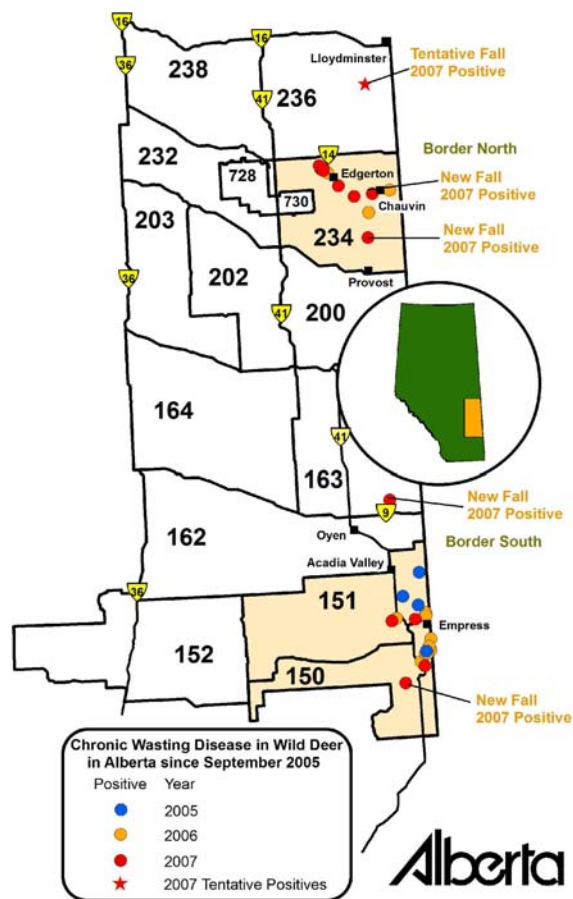
Our impression is that there is a high degree of cooperation in Alberta between Alberta Agriculture and Food and the Fish and Wildlife Division of Alberta Sustainable Resources Development in the development of CWD surveillance and management programs for the farmed and wild cervids regulated by the two agencies. We believe this approach is essential to successful control of CWD in both populations. When CWD is present in a farmed cervid facility there is inherent risk to the free-ranging wildlife in the vicinity; conversely, when CWD is present in free-ranging wildlife there is inherent risk to farmed cervid facilities in the area. Therefore, the spread of CWD to new locations on either side of the fence produces new risks to both sectors and the decisions and actions taken by each agency to detect CWD and respond to the disease once it is discovered, impacts the other. Consequently, there is a need for high accountability on both sides to manage risk reduction.

We strongly suggest that an external review of the AFD CWD program would be timely and valuable to pair with the external peer review just completed by this Panel. We understand that the AFD and FWD working together have implemented surveillance and import controls to detect the presence of CWD in farmed cervids as well as to limit the risk of introduction of CWD. However, the continued presence of CWD in wildlife in eastern Alberta may necessitate additional actions to attempt to mitigate risk of spread of CWD from wildlife to the animals in those facilities and from these facilities to others in Alberta via live animal movements. It may be that such actions are already being taken, but this information was beyond the purview of our review.

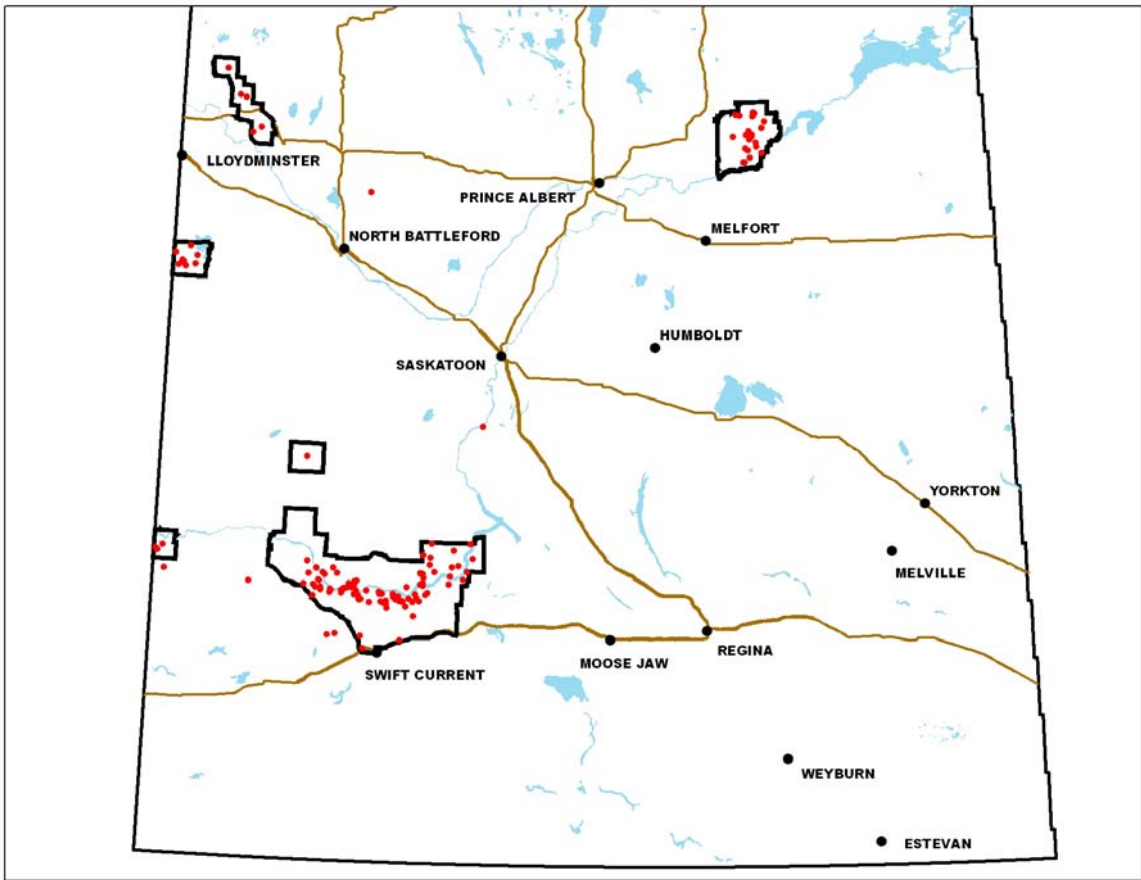
Concluding Statements

CWD presents unique and difficult challenges to wildlife managers faced with addressing the presence of this disease in their wildlife populations. A decision to respond to CWD in Alberta is laudable and compatible with the viewpoint that CWD is a disease foreign to the province's native ecosystems and that increased infection rates and geographic spread of CWD are the anticipated consequences without a control effort. Additionally, the applications of CWD control tools that may be developed in the distant future (e.g., vaccination, targeted identification and culling of only CWD positive deer) will be much easier with lower density deer populations and geographically smaller endemic foci of CWD. The Review Panel believes that, if the current underlying assumptions regarding the presence of CWD in Alberta are true, the situation in Alberta is one that lends itself to the possibility of success in controlling the spread of CWD to new areas in the province as well as providing an opportunity to explore novel approaches to control that have not yet been attempted elsewhere. The Program Review Panel commends Alberta, including all cooperating agencies, landowners, hunters, and others for their efforts to date on CWD management.

Maps



CWD in wild deer in Alberta as of January 7, 2008.



CWD in wild deer in Saskatchewan as of April 2007. Courtesy of Saskatchewan Environment.

Appendices



Appendix A

Fish and Wildlife Division of Alberta Sustainable Resource Development:

Specific Questions for Peer Review Panel Input

- 1) Given the current information, is it a valid assumption that wild deer in Saskatchewan are the most likely source of CWD seen in wild deer in Alberta?

... and that MD and WTD in areas in Alberta adjacent to known cases in Saskatchewan are at greatest risk of infection.
- 2) Given current information and Alberta's history regarding potential risk activities:
 - a. Is it reasonable to believe that CWD is a recent arrival in eastern Alberta?
 - b. Is herd reduction likely to reduce further spread of CWD in eastern areas?
 - c. Is it reasonable to believe that CWD can be managed at the periphery of the two known enzootic foci in SK?
- 3) Were past CWD surveillance efforts in Alberta sufficient to identify CWD risk areas
 - a. Along the AB/SK border?
 - b. In the targeted area in central Alberta (north and west of Edmonton)?
 - c. In the remainder of the province?
- 4) Is Alberta's aggressive response to findings of CWD along the eastern border justified? .. should it be more? ... should it be less?
 - a. Are there additional management actions that should be taken to prevent further spread of CWD in wild deer in Alberta?
- 5) Is the proposed provincial strategy for managing CWD (combined maximum hunting opportunities, generalized reduction of deer density in at risk areas, targeted removal of deer in the vicinity of known cases of CWD) ...
 - a. appropriate to the risk in Alberta?
 - b. justified based on current information regarding the disease, current evidence of disease transmission, and history/likelihood of CWD occurrence in Alberta?
 - c. Can the provincial strategy be improved in terms of the goal to limit further spread of CWD in/into Alberta?
 - d. Is a five-yr framework reasonable to apply current provincial strategy, subject to ongoing adaptive review and full evaluation in 5 yrs?
- 6) Since the CWD Expert Panel Report prepared in 2004, is there any new evidence to suggest that...
 - a. CWD is a natural component of native ecosystems in wild deer in western Canada?
 - b. Deer density of <math><1 \text{ km}^2</math> of critical habitat is unlikely to achieve CWD control/containment?

Appendix B

August 9, 2007

ALBERTA CHRONIC WASTING DISEASE CONTROL STRATEGY

Note: This strategy is based on Canada's National Chronic Wasting Disease Control Strategy, as found at: <http://wildlife1.usask.ca/Publications/NCWDCS2005.pdf>

Executive Summary

Alberta's provincial plan provides the flexible long-term direction to control and eventually eliminate chronic wasting disease (CWD) in deer in Alberta. Details of the plan can be updated or modified in light of new findings but the general framework provides an ongoing basis on which to address the risks associated with this disease. The plan has five primary goals associated with: prevention, detection (=surveillance), response & management, research, and communication.

The general approach combines risk-based surveillance with aggressive response and communication. Cooperative research facilitates adaptive management and provides a basis for improving program design and delivery. Communication, both internal and external, is essential to the long-term success in eliminating CWD from Alberta.

Activities directed by the provincial plan focus on herd reduction as the key management tool to reduce the risk of CWD entering the province and limit spread in areas where CWD already exists in Alberta. Herd reduction is achieved through aggressive harvest by recreational hunters combined with targeted removal of deer to achieve identified density goals. The program relies heavily on landowner and stakeholder support.

Herd reduction addresses three specific levels of risk:

- *potential risk: general lowering of deer density over broad areas at risk of future invasion with CWD*
- *identified risk around a known case: elimination of deer in 10km circles around infected deer*
- *identified risk around a cluster of cases: density reduced to <1 deer/km²*

Introduction

- ◆ To date, chronic wasting disease (CWD) has been found near Chauvin, Edgerton, and Empress, Alberta. Without immediate control action the disease will spread through Alberta's deer and elk populations and seriously affect an agricultural and recreational industry valued in excess of \$200 M per year.
- ◆ Chronic Wasting Disease is new to Alberta. There is an urgent need to control and eradicate CWD before it establishes in deer populations. Once established, its elimination will be very difficult, if not impossible.

- ◆ Chronic Wasting Disease is a fatal prion disease (like BSE) that can establish in wild mule deer, white-tailed deer, and elk populations. A few infected wild moose were found in Colorado. Woodland caribou likely are susceptible.
- ◆ The disease was transported to Canada in infected game farm elk moved from South Dakota to Saskatchewan. No other source of CWD in Canada is known. Elk are more susceptible in farm settings than in the wild.
- ◆ Unless controlled, Chronic Wasting Disease will have major negative effects on Alberta's wild deer populations (see Appendix 1 for details).
- ◆ If CWD establishes in Alberta it will significantly reduce consumptive (including commercial) and non-consumptive recreational opportunities and have serious negative environmental, economic, and social impacts. Additional effects will be felt in tourism as well as agricultural and rural economic sectors.
- ◆ There is an ongoing CWD outbreak in Saskatchewan, with cases found on 41 elk and deer farms, and in some 150 wild deer, to date.
- ◆ Alberta has documented CWD in 29 wild mule deer and white-tailed deer in the Chauvin, Edgerton and Empress areas, as well as in 1 farmed elk and 2 farmed white-tails.
- ◆ Alberta and Saskatchewan are the only Canadian provinces in which CWD is known to occur.
- ◆ Canada has an approved National Chronic Wasting Disease Control Strategy. See <http://wildlife1.usask.ca/Publications/NCWDCS2005.pdf>
- ◆ Open communication is an important element of successful Chronic Wasting Disease management.

Guiding principles

1. Based in science
2. Collaborative with landholders, stakeholders, disease experts, and other jurisdictions
3. Strategic investment in long term security of deer and cervid-associated economic benefits
4. Adaptive approach to develop and implement best management practices
5. Transparent and cooperative communication

Ultimate objectives

1. Eradicate chronic wasting disease from Alberta
2. Prevent future introduction of CWD into Alberta

Interim objectives

1. Identify CWD occurrence in risk areas in Alberta.
2. Isolate and contain CWD within a minimal geographic area (prevent spread).

3. Eliminate CWD found in Alberta as soon as possible.
4. Maintain public support for CWD control and deer management programs, as well as maximize deer hunting opportunities across Alberta.

Goal 1: Prevent Chronic Wasting Disease from entering the province

Key Components: the primary means of CWD entering Alberta are through dispersal of infected wild deer from western Saskatchewan or importation of infected farmed cervids. The current import protocols applied to farmed cervids entering the province successfully mitigate the latter risk and are critical to ongoing disease prevention. The protocols will not be expanded upon in this document.

Methods to reduce movements of infected wild deer into Alberta are limited and involve creating a buffer of low population density to reduce the probability of movement and disease transmission along portions of the border. In identified risk areas, aggressive increased recreational harvest opportunity is combined with selective herd reduction to reach target density goals.

Strategies:

1. Establish Chronic Wasting Disease Risk Areas, areas of general potential risk of CWD incursion from adjacent lands.
In general, reduce deer density in a buffer strip incorporating all wildlife management units (WMUs) along the Saskatchewan border between Twp 61 and Medicine Hat. Although no specific target density goals are established, populations must be driven below current deer management goals and as low as possible, within the limits of recreational harvests.
2. Maximize deer harvest opportunities for recreational licence holders within CWD Risk Areas
3. If CWD is identified in a Risk Area, response strategies are applied as below.

Goal 2: Early Detection of Chronic Wasting Disease

Key Components: increased surveillance in areas of potential or known risk. Potential risk for CWD to occur in wild deer exists along the Alberta/Saskatchewan border from north of Lloydminster to Medicine Hat. Currently, there are two areas of identified risk of CWD in Alberta and adjacent areas in Saskatchewan.

Strategies:

1. Enhance current CWD surveillance along the Alberta/Saskatchewan border by implementing mandatory submission of heads of all deer harvested under recreational hunting licences in CWD Risk Areas.
 - currently border WMUs from Cold Lake to Medicine Hat (WMU 500 south to WMU 148, inclusive)
2. Encourage voluntary submission of heads of harvested deer in WMUs adjacent to CWD Risk Areas.
3. Fish and Wildlife Division personnel will collect and submit for testing any deer, elk, moose, caribou, or antelope that is emaciated or exhibits clinical neurologic signs of CWD. Inform the public of the need to report all such individuals. (as described in the informational brochure posted at:
www.srd.gov.ab.ca/fishwildlife/livingwith/diseases/pdf/CWD%20Brochure%202006.pdf)
4. The Fish and Wildlife Division will work cooperatively with Alberta Agriculture and Food, and with game farm producers to decrease the risk of occurrence and increase the probability of detecting Chronic Wasting Disease in farmed cervid populations, if it occurs. It is critical that game farm inventory and transaction records are maintained. Also, effective perimeter fencing must be maintained at all facilities, and any escapes of game farmed animals must be reported immediately to appropriate government agencies.

Goal 3: Planned Response and Effective Management of Chronic Wasting Disease

Key Components: establish Chronic Wasting Disease Control Areas subsequent to identification of any case of CWD, whether in a farmed or wild cervid and appropriate to the identified risk. Management response differs depending on the temporal and spatial distribution of detected cases of CWD. The Control Area size and shape depends on CWD presence, deer densities, and patterns of habitat use. Strategies are adapted for various situations.

- 3.1 Response to any isolated case of Chronic Wasting Disease (i.e. in a new area). The objective is to remove any deer that may have been in recent contact with the infected deer.

Strategies:

1. Attempt to remove all deer within a 10 km radius* of the infected deer.
 - *general guideline. Specific boundary may be modified to incorporate concentrations of deer or deer habitat on the periphery of the circle.
2. Implement intensive herd reduction through direct cull. If recreational seasons are pending at time of discovery, maximize recreational harvest potential in conjunction with landholder support, then follow with cull activities as needed to achieve zero deer density within 10 km circle.

- 3.2 Response in an area in which Chronic Wasting Disease is established. The objective is to eliminate deer within 10 km circles around infected deer and contain the infection within a minimal geographic area by reducing deer density throughout the CWD Control Area to a maximum of 1 deer/km², including areas of deer concentration, for 5 years, as recommended by the Chronic Wasting Disease Expert Panel.¹ If no additional positives are detected during the 5-year period, CWD will be considered eliminated, and intensive deer population reduction phased out.

¹panel report available at:

Strategies:

1. Use risk assessment and surveillance data to define the area in which CWD is established. Describe appropriate boundaries for a CWD Control Area within which aggressive herd reduction can be applied.
2. Design field collection program to eliminate deer in 10 km circles around infected deer. Deliver combined herd reduction and increased hunter harvest to reduce deer density in CWD Control Areas to target temporal, spatial, and numeric goals.
3. If CWD is identified over a sufficiently large area, work inward from the periphery of the Control Area to reduce deer density to $< 1\text{deer}/\text{km}^2$ in all portions of the Control Area, including areas of deer concentration (e.g. winter range). Maintain this deer density until the disease is eliminated.
- 3.3 Response to CWD in a game farm animal. The Canadian Food Inspection Agency (CFIA) is responsible for disease management on the infected farm. Alberta Agriculture and Food works cooperatively with CFIA. The Alberta Government is responsible for disease surveillance and management in the adjacent wild deer population. The objective is to determine whether there is CWD in wild deer in the vicinity of an affected farm and if so, eliminate it. Strategies depend upon case-by-case circumstances.

Strategies:

1. If the game farm is considered a low risk (e.g. good fences, good records, no incidence of escapes, good testing), a hunter-based surveillance program will be initiated in the WMU containing the affected farm.
2. If the game farm presents a higher level of risk, a more aggressive program commensurate with the risk will be developed. This may include immediate active surveillance or reduction of wild deer populations within a 10 km radius of the affected farm.

Goal 4: Research and Chronic Wasting Disease

Key Components: On-going research involving prion diseases occurs in various universities and research institutes in Canada and the United States. Maintain communications and involvement as appropriate.

Strategies:

1. The Division remains connected to the national and international Chronic Wasting Disease research network and benefits from the results and information shared among its participants. Locally, the Alberta Prion Research Institute set up by Alberta Ingenuity receives applications for a wide range of research topics, including various aspects of CWD. The Fish and Wildlife Division and the University of Alberta, conduct cooperative research to inform adaptive management processes and improve provincial CWD programs.

2. Where possible, supplemental samples and/or data collected during herd reduction programs are provided for research use.
3. Maintain opportunities to share information and research activities with Saskatchewan Environment.
4. Results of all CWD research initiatives assist Divisional programs.

Goal 5: Communications and Chronic Wasting Disease

Key Components: An effective communications and education program is essential to the successful management of CWD and the associated management of deer populations. Components of this program must target the general public, special interest groups, local affected communities, and affected agricultural producers/landowners/landholders.

Strategies:

1. Develop a formal communications plan to provide information on short-term and long-term disease and deer management objectives.
2. Deliver a range of products, materials, and presentations at various outlets to address a wide range of audiences (internal and external).
3. Be proactive with communications regarding Chronic Wasting Disease.
4. Develop interdisciplinary messages in cooperation with provincial agencies associated with agriculture and health.

Appendix C

Biographical sketches of Peer Reviewers

Dr. Julie Langenberg has worked with the Wisconsin Department of Natural Resources as veterinarian and leader of the Wildlife Health program since 1999. She obtained her veterinary degree from the University of Pennsylvania in 1982, and then did pathology residency work at the National Zoo, Washington D.C. and a post-doctoral diploma in wildlife medicine at the University of Sydney, Australia. She has provided clinical service in wildlife medicine and taught at the University of Pennsylvania and University of Wisconsin, participated in wildlife disease research with the U.S. Department of the Interior, and practiced conservation medicine with the International Crane Foundation, Baraboo, Wisconsin. Since 2002, Dr. Langenberg has led Wisconsin's surveillance and management programs for chronic wasting disease, including collaborating on a number of CWD research projects and providing technical advice to national and international CWD working groups.

Dr. Michael Miller has served as a wildlife veterinarian for the Colorado Division of Wildlife since 1989. In that capacity, he has researched a variety of topics related to the ecology and management of infectious diseases in free-ranging wildlife in Colorado and other states. Chronic wasting disease (CWD), the naturally-occurring prion disease of native North American cervids, has been the focus of a considerable part of Dr. Miller's research throughout the last decade. His studies, in collaboration with the late Dr. Elizabeth Williams and a host of other prion disease investigators, have included work on various aspects of CWD epidemiology, as well as on development and evaluation of surveillance systems and diagnostic tests used to detect and monitor infections in free-ranging populations of deer and elk. Dr. Miller is one of several collaborating scientists involved in surveillance-based adaptive management of CWD in North America, and has served in an advisory capacity to wildlife biologists designing surveillance programs to detect and contain new foci of CWD.

Dr. Lynn Creekmore obtained her veterinary degree from the University of Tennessee in 1986 followed by additional graduate work at the University of Georgia. From 1987 - 1992 she worked as a Staff Diagnostician for the University of Georgia's Southeastern Cooperative Wildlife Disease Study in Athens, GA where her primary focus was on wildlife disease issues in upland game species of the Southeast. From 1992 – 1999 she was employed as a Wildlife Disease Specialist at the U.S. Department of Interior's National Wildlife Health Center in Madison, WI. There she worked on disease issues in migratory and endangered species in the western U.S. She joined USDA in October 1999 as a Staff Veterinarian and Wildlife Disease Liaison for the USDA, APHIS, VS, National Center for Animal Health Programs. In that position she was involved in the development of a national chronic wasting disease (CWD) program for farmed elk and deer. Dr. Creekmore joined the APHIS Western Regional Office in Fort Collins, CO, in June of 2004. As a regional epidemiologist she works on CWD, equine issues, and aquaculture.