UNDERSTANDING CHRONIC WASTING DISEASE (CWD)

AND

CWD MANAGEMENT PLANNING BACKGROUND

April 5, 2002

Prepared by:
Glenn D. DelGiudice, Ph.D.
Forest Wildlife Populations and Research Group

Division of Wildlife
Minnesota Department of Natural Resources

EXECUTIVE SUMMARY

The primary purposes of this document are:

1) to provide a thorough understanding of chronic wasting disease (CWD), its distribution nationwide, and circumstances in Minnesota that make the state vulnerable to the threat of CWD infection; and

2) to provide a general outline of the Minnesota Department of Natural Resources= (MNDNR) comprehensive management approach to reduce the threat to free-ranging and game-farm captive cervids (elk and deer) and to effectively manage against CWD should it emerge within the state.

This document outlines MNDNR=s proposed CWD management programs for free-ranging deer and elk. It also discusses potential approaches for improving regulation of captive cervid facilities, including current weaknesses in the statutes or rules regulating elk and deer game farms registered with the MNDNR.

As background and to further facilitate a thorough understanding of CWD and the complicated management challenges it poses, the following appendices are included:

Appendix A. Brief review of what is currently known and unknown about CWD;
Appendix B. State status reports that describe aspects of other states' regulation and management of captive cervids and CWD monitoring and management;
Appendix C. Description of the Minnesota Board of Animal Health=s (BAH) CWD Surveillance Program, designed primarily for captive elk;
Appendix D. Description of a proposed National CWD Surveillance Program; and
Appendix E. Cervid import requirements for Minnesota (BAH).

Chronic wasting disease is an infectious neurological disease that naturally occurs in North American deer and Rocky Mountain elk and belongs to the group of infectious diseases known as transmissible spongiform encephalopathies (TSEs). Chronic wasting disease is a progressively fatal disease with no known immunity, vaccine, or treatment. However, there has never been a case reported in a human.

The first cases of CWD were detected in captive deer and elk in the late 1960s-1970s, but it was not until the mid 1980s to early 1990s that additional infections drew the attention of the scientific and management communities.

Although CWD has been detected in both captive and free-ranging deer and elk in other states, CWD has not been detected in either captive or free-ranging deer or elk in Minnesota.

Management of CWD is complicated by a number of factors. Much about CWD remains unknown or poorly understood. Clinical signs of the disease may not become apparent for 18-36 months (*incubation period*), during which time the animal is potentially infectious to other cervids. And, until recently, there has been no live-animal test for detecting the disease.

Management has been further complicated by the fact that legal responsibilities for managing captive deer and elk have either been unclear, or divided between government agencies. Frequently, regulation and enforcement capacities and abilities vary between agencies. The numbers of captive cervid operations and animals, financial investments, and the intra- and interstate movement of captive elk and deer also vary markedly between states.

There are 204 captive elk herds and 18 combination elk/deer operations registered with the Minnesota Board of Animal Heath (BAH), accounting for approximately 11,000 elk. This is more captive elk than in any other state, with the possible exception of Colorado. There are also 27 captive deer herds registered with BAH. Since 1998, there has been a 45% increase in cervid herds registered with the Minnesota BAH. In addition, forty-three elk herds (total of 655 elk) and 366 white-tailed deer herds (total of 17,500 deer) are present on MNDNR licensed game farms.

In 1999, the BAH developed a *voluntary* state CWD Surveillance Program, primarily for elk. Currently, 150 captive elk herds (73%), 15 of the elk/deer operations (83%), and 3 captive deer facilities (11%) registered with the BAH are enrolled in the program. This program requires that all cervids older than 16 months of age that die or are destroyed must be tested for CWD. Further, rigorous annual inventories must be conducted, operations must comply with importation restrictions, and advanced herd status is achieved with the number of years participating operations remain CWD-free. (The BAH would prefer that the program be *mandatory* for at least all captive elk operations, but currently, funds and personnel are insufficient to operate the program at that scale.)

Captive elk and deer operators in Minnesota, whether registered with the BAH or MNDNR, must request an importation permit from the BAH (see Appendix E). On December 17, 2001, the BAH approved specific restrictions on the importation of *elk only* due to the health threat posed by CWD to Minnesota livestock. In early March 2002, shortly after the report of 3 CWD-infected deer in Wisconsin, the Minnesota BAH approved new restrictions on all *cervid* importation. *No deer or elk* originating from an area considered to be endemic for CWD will be allowed into Minnesota, and none can be imported from a herd that is infected or exposed to CWD, until that herd has been cleared to the satisfaction of the Board. *All imported elk* must be from a herd that has been participating in a state recognized CWD Surveillance Program for at least one year.

During the past year, the MNDNR has been conducting targeted surveillance, wherein brain stems of about 12 Asuspect@ deer (those exhibiting clinical signs that may be consistent with CWD or that died of unknown causes) were collected and CWD-tested. Additionally, during the fall 2001 season, brain stems were collected from 43 hunter-harvested deer in southern Minnesota and tested for CWD. The results of all tests were negative.

The risk of CWD introduction into Minnesota captive cervid herds and free-ranging populations may be increasing, due in part to antiquated and inadequate game farm regulations

and oversight. Weaknesses in procedures, statutes and rules regulating cervids on game farms licensed by MNDNR have been identified, and include: (1) game farm registration records and associated data (e.g., animal inventory, annual additions to and losses from herds) have not been computerized, and consequently, are not readily available for effective monitoring; (2) fencing regulations are inadequate for preventing contact between captive and free-ranging cervids; (3) escapes of captive deer or elk from game farms are not required to be reported; (4) there is no statutory language prohibiting the release of captive deer or elk into the wild; and (5) there are no surveillance or testing requirements for CWD.

MNDNR is in the process of computerizing game farm records in order to improve oversight, and will propose regulations that prohibit the release of any cervids (deer, elk, exotics) from game farms, and ban importation of all cervids to game farms. MNDNR will work with other agencies and organizations in an attempt to comprehensively address the management of captive cervids under one uniform system. This will require a legislative initiative in the 2003 session. In the meantime, MNDNR will do what it can to strengthen importation and release provisions through existing rule-making authorities.

More stringent regulation of cervid game farms will reduce the risk of CWD infection occurring in Minnesota=s captive and free-ranging cervid populations; however, some level of risk will persist. That risk, and the difficulties associated with CWD already discussed, dictate that a comprehensive management program for free-ranging cervids be formulated with expediency before emergence of the disease in Minnesota.

MNDNR=s CWD management plans for free-ranging cervids include five essential components or objectives:

1) ongoing targeted surveillance statewide (i.e., collecting and CWD-testing deer/elk exhibiting signs which may be consistent with CWD);

2) development and implementation of a geographically-focused Monitoring Plan involving the sampling and CWD-testing of hunter-harvested deer;

3) development of a Contingency Plan for rapidly responding to CWD should it be detected in the state;

4) conduct research on the epizootiology (i.e., population effects) and effective management of CWD; and

5) education and information-sharing with the public, constituents, MNDNR and other government agency personnel concerning CWD.

INTRODUCTION

Chronic wasting disease (CWD) is an infectious neurological disease that naturally

occurs in North American deer and Rocky Mountain elk and belongs to the group of infectious diseases known as transmissible spongiform encephalopathies (TSEs). Other TSEs include bovine spongiform encephalopathy (BSE) or "mad cow disease" in cattle, scrapie in domestic sheep, Creutzfeldt-Jakob disease (CJD) and new variant CJD in humans. Chronic wasting disease is a progressively fatal disease with no known immunity, vaccine, or treatment.

Chronic wasting disease has not been detected in captive or free-ranging cervids in Minnesota. However, CWD infections of captive elk in Colorado, Wyoming, Nebraska, Kansas, Oklahoma, Montana, South Dakota, and Saskatchewan have been reported. Furthermore, infections of free-ranging mule deer, white-tailed deer, and/or elk have been documented in Colorado, Wyoming, Nebraska, South Dakota, Wisconsin, and Saskatchewan.

Several aspects of CWD (e.g., long incubation period) and the human market for captive elk and deer (involving intra- and interstate movement of these animals) are contributing to the high potential risk of introducing and spreading this disease and to the difficulties associated with managing it. Strict safeguards are the most effective means of preventing the introduction and establishment of this disease in Minnesota.

Management guidelines and strategies currently employed by various state and federal natural resource and agricultural agencies vary widely and are changing rapidly. Management of CWD is complicated by a number of factors. Much about CWD remains unknown or poorly understood. Clinical signs of the disease may not become apparent in a deer or elk for 18-36 months (incubation period), during which time the animal is potentially infectious to other cervids. Until recently, there has been only a post-mortem test for detecting CWD in cervids (no live animal test).

Although the first cases of CWD were detected in captive deer and elk in the late 1960s, it was not until the mid 1980s to early 1990s that additional infections drew the attention of the scientific and management communities. Management has been further complicated by the fact that legal responsibilities for managing captive deer and elk operators have been either unclear (e.g., until about 1991 in South Dakota) or divided between agencies (e.g., Departments of Agriculture, Boards of Animal Health, and Departments of Natural Resources). Frequently, different statutes and rules apply and enforcement capacities and abilities vary across agencies. The number of captive cervid operations and animals, financial investments, and the intra- and interstate movement of elk and deer also vary markedly among states.

PURPOSE AND BACKGROUND

The primary purposes of this document are:

1) to provide a thorough understanding of chronic wasting disease (CWD), its distribution nationwide, and circumstances in Minnesota that make the state vulnerable to the threat of CWD infection; and

2) to provide a general outline of the Minnesota Department of Natural Resources (MNDNR) comprehensive management approach to reduce the threat to free-ranging and game-farm captive cervids (elk and deer) and to effectively manage against CWD should it emerge within the state.

As background and to further facilitate a thorough understanding of CWD and the complicated management challenge it poses, the following appendices are included:

Appendix A. Brief review of what is currently known and unknown about CWD;

Appendix B. State status reports that describe aspects of other states' regulation and management of captive cervids and CWD monitoring and management;

Appendix C. Description of the Minnesota Board of Animal Health (BAH) CWD Surveillance Program, designed primarily for captive elk;

Appendix D. Description of a proposed National CWD Surveillance Program; and

Appendix E. Cervid import requirements for Minnesota (BAH).

MINNESOTA CAPTIVE ELK AND DEER

The scale of captive elk and deer farming, the reported incidence of CWD infection (in captive and free-ranging cervids), and state agency regulatory jurisdictions vary markedly among states (see Appendix B). While it is clear from documents and discussions with numerous government biologists, veterinarians, and administrators that states share certain management concerns and considerations relative to CWD infection, official responses have varied.

Minnesota cervid farmers have the option of registering with the state Board of Animal Health or obtaining a Game Farm license from MNDNR. The following is a status report for Minnesota:

BAH-Registered Herds. There are currently 204 captive elk herds and 18 combination elk/deer herds registered with the Board of Animal Health in Minnesota, accounting for an estimated 11,000 elk. This is more captive elk than in any other state, except possibly Colorado. Average herd size is 50 elk. Additionally, there are 27 captive deer herds registered with BAH.

Since 1998, there has been a 45% increase in cervid herds registered with the BAH.

MNDNR Game Farm Cervids. Forty-three elk herds (total of 655 elk) are registered with MNDNR; average herd size is 15 elk. Further, 366 white-tailed deer game farms that include approximately 17,500 deer, are registered with MNDNR. About 15-20 mule deer occur on these game farms.

MINNESOTA CWD STATUS

Captive Herds

There have been no reported CWD infections of elk or deer (captive or free-ranging) in Minnesota. Some elk from CWD positive herds were imported into the state from Colorado in the fall of 2001, but follow-up testing of imported animals was negative. In 1999, the BAH developed a *voluntary* state Chronic Wasting Disease Surveillance Program, primarily for elk. Currently, 150 captive elk herds (73%), 15 of the elk/deer operations (83%), and 3 captive deer facilities (11%) registered with the BAH are enrolled in their CWD Surveillance Program. Importantly, the BAH would prefer that the program be *mandatory* for at least all captive elk operations; however, currently, funds and personnel are insufficient to operate the program at that scale. There is currently no formal surveillance program for cervids kept on game farms licensed by MNDNR, although game farms may voluntarily participate in the BAH CWD Surveillance Program. (for more detail on the BAH CWD Surveillance Program, see Appendix C).

Free-Ranging (Wild) Cervids

During the past year, brain samples from about 55 free-ranging Minnesota white-tailed deer have been collected and sent to the USDA Veterinary Services Laboratory in Ames, Iowa. All samples tested for CWD by the immunohistochemical (IHC) test for proteinase-resistant prion proteins (PrP^{res}) were negative.

MNDNR has conducted limited *targeted surveillance* of white-tailed deer over the past year. Targeted surveillance is considered to be the primary initial approach to determining presence or absence of CWD statewide. Targeted surveillance involves collection and CWD-testing of any Asuspect@ cervids that are exhibiting signs or symptoms of disease that could be consistent with CWD (e.g., emaciation, lack of coordination). These were animals that may have been found recently killed by one of a number of causes, or they were sick animals that were euthanized to allow removal of the needed brain tissue sample (a specific portion of the brain stem -- obex of the medulla oblongata). Of the 55 total samples, targeted surveillance so far has resulted in samples from12 deer that exhibited signs of illness, or that simply died of unknown causes. All CWD tests on these animals were negative.

Targeted surveillance can be augmented by *geographically-focused surveillance* that involves more generalized collection and testing of brain stems from pre-determined sample

sizes of deer harvested by hunters during the annual season. During fall of 2001, an additional 43 samples were tested from hunter-harvested deer, about half from southeastern and about half from southwestern Minnesota. All were negative for CWD.

Importation of all cervids

Captive elk and deer operators in Minnesota, whether registered with the BAH or licensed by MNDNR, must obtain an importation permit from the BAH. Importation of elk and deer requires health certificates and specific tests and clearance for tuberculosis and brucellosis. Elk must also be imported only from a herd monitored for CWD for a specified minimum length of time and may not come from a CWD endemic area for free-ranging deer and elk (as discussed below).

On 17 December 2001, the BAH approved the following restrictions on importation of elk due to the health threat posed by CWD to Minnesota livestock (quoted from a BAH document, 2001):

> *No elk* will be permitted entry into Minnesota if they originate in herds:
> - located in the area of the United States where CWD is endemic in the free-ranging deer and elk,
> - that have purchased elk from CWD-infected herds unless these herds are cleared to the satisfaction of the BAH,
> - infected with CWD,
> - that have not been in a state recognized CWD Surveillance Program for at least one year.

Further, in early March 2002, shortly after the report of 3 CWD-infected, free-ranging male white-tailed deer in Wisconsin, the BAH approved a new motion to strengthen restrictions on cervid importation as follows (see Appendix E.):

> *No cervid (includes deer)* originating from an area considered to be endemic for chronic wasting disease will be allowed entry into Minnesota. This area includes the following states and counties:
>
> **Wyoming:** Albany, Carbon, Converse, Laramie, Platte, Niobrara, Goshen
> **Nebraska:** Kimball, Sioux, Banner, Scotts Bluff, Cheyenne, Deuel, Keith, Perkins, Chase
> **Colorado:** Boulder, Gilpin, Larimer, Weld, Logan, Morgan, Phillips, Sedgwick, Washington
> **South Dakota:** Fall River
> **Wisconsin:** Dane, Iowa, Sauk, Columbia, Juneau, Jefferson, Rock, Green, Lafayette
>
> *No cervid* can be imported that is from a herd that is infected or exposed to CWD, or that has purchased a cervid from an infected herd, unless the herd has been cleared to the

satisfaction of the Board.

All elk imported must be from a herd that has been participating in a state recognized CWD Surveillance Program for at least one year. The CWD herd number and numbers of years in the program must be written on the Certificate of Veterinary Inspection..

MN DNR=s PROPOSED CWD MANAGEMENT PLAN: AN OUTLINE

Diseases such as CWD tend to be most effectively managed when efforts are applied before or as the disease emerges, rather than after it becomes established. Chronic wasting disease is an emerging disease. The current number of known infections among captive elk varies markedly among states (and Canada) and is increasing steadily with continued surveillance and investigations. Even more disturbing is the increased prevalence and geographic spread of CWD in free-ranging mule deer, white-tailed deer, and elk; most disturbing of all is the recent discovery of CWD in free-ranging white-tailed deer in Wisconsin, approximately 700 miles east of any previously known infection.

Further, in some local areas prevalence appears to be increasing at a more rapid rate than in the past, although it is not clear whether or not this is because of increased incidence or increased surveillance, reporting, and testing. Minnesota=s cervid management (MNDNR and BAH) and health agencies can learn a great deal from the knowledge gained by states with previous direct experience managing CWD and those states are being consulted in the development of Minnesota=s plans.

CWD has not been found in Minnesota, but it has been found in adjoining states to the west and east (i.e., South Dakota and Wisconsin). As a result, MNDNR is developing stepped up targeted and geographically-focused *surveillance plans* to monitor free-ranging deer for presence of the disease and a *contingency plan* to guide MNDNR=s response if CWD is detected here. MNDNR is also evaluating *cervid management laws, rules, and policies* for those captive and free-ranging cervids that are under MNDNR authority to identify issues and weaknesses related to disease management. In these efforts, MNDNR will work with other agencies and organizations responsible for or concerned about free-ranging and captive cervid disease management in an attempt to assure comprehensive approaches to effective management of CWD risks.

Free-Ranging Cervids

Comprehensive management plans for CWD detection and response in free-ranging cervids are being formulated. Review of CWD management plans of other state natural resource management agencies (e.g., Colorado, Nebraska) with more experience with CWD was of value in formulating the general outline for the proposed plan described below, and consultation with other states will continue in the development of more detailed plans.

MNDNR CWD management plans for free-ranging cervids will include at least 5 essential components or objectives:

1) ongoing targeted surveillance statewide (i.e., collecting and CWD-testing deer/elk exhibiting signs which may be consistent with CWD);

2) development and implementation of a geographically-focused Monitoring Plan involving the sampling and CWD-testing of hunter-harvested deer;

3) development of a Contingency Plan for rapidly responding to CWD should it be detected in the state;

4) conduct research on the epizootiology (i.e., population effects) and effective management of CWD; and

5) education and information-sharing with the public, constituents, MNDNR and other government agency personnel concerning CWD.

Each of these general objectives is discussed in more detail below:

1) Continue Targeted Surveillance of Free-Ranging Deer Statewide

For about a year MNDNR has been collecting brain stems for CWD-testing from "suspect" free-ranging deer (i.e. deer exhibiting signs that may be consistent with CWD or that died recently under questionable or unknown circumstances). This practice has been reported by researchers in other states to be particularly useful to detecting the presence/absence of CWD in local areas statewide. MNDNR will continue testing "suspect" free-ranging deer for CWD.

2) Development and Implementation of a Geographically-focused Monitoring Program for Free-Ranging Deer

A geographically-focused free-ranging deer Monitoring Program will be implemented during the fall 2002 deer hunting season. This will involve collection and CWD-testing of brain stems from a pre-determined number of deer harvested by hunters in select areas of the state. Areas will be selected based on a variety of criteria, which may include proximity of captive elk/deer operations, deer density, number of check stations and availability of samples, and

proximity to areas where CWD has been detected (e.g., 10 CWD-infected deer recently found in Wisconsin). This type of Monitoring Program will augment the targeted surveillance in detecting presence or absence of CWD, and in determining prevalence should the disease be detected.

3) Development of a Contingency Plan for rapidly responding to CWD should it be detected in the state.

A) Preventing the Transmission of CWD Between Captive and Free-Ranging Cervids. The potential for transmission of CWD between captive and wild cervids may be minimized by limiting private possession of deer and elk in local areas where CWD has occurred; by minimizing or eliminating the potential for physical contact between captive and wild cervids (as by more stringent fencing requirements such as double-fencing and requiring frequent fence inspections); by immediate reporting of captive animals that have escaped or wild animals that have entered a captive facility; and by requiring captive animal CWD surveillance and reporting.

*B) Limiting the Distribution of CWD in Free-ranging Deer and Elk.*Chronic wasting disease may spread naturally (i.e., infectious contacts between deer), as well as by the inadvertent influence of humans (e.g., inadvertent movement of CWD-infected animals). The distribution of CWD among free-ranging cervids may be limited by 1) preventing inadvertent movements of CWD-infected free-ranging animals, 2) reducing factors that lead to increased physical contact between free-ranging and captive cervids; 3) limiting potential sources of CWD infection from hunter-harvested carcasses from CWD endemic areas; and 4) use of ongoing targeted surveillance and field investigations to detect CWD and monitor changes in prevalence and distribution.

C Reducing the Occurrence of CWD in Free-Ranging Deer and Elk
Chronic wasting disease transmission may be reduced by: 1) encouraging public reporting of suspect animals and promptly culling (killing) and testing wild deerexhibiting symptoms consistent with CWD statewide; 2) prohibiting feeding of wild cervids (include education of public on the adverse effects of feeding); 3) reducing high deer densities through increased hunting or by culling in areas where CWD has occurred; and 4) other alternative strategies developed through cooperative research and management. Alternative strategies could include integrated field and modeling efforts examining methods for monitoring population size, disease prevalence, disease and system responses to population reduction by hunting and culling.

4) Research on the Epidemiology, Epizootiology, and Management of CWD

Research of the numerous aspects of CWD that remain unknown or poorly understood is essential to assuring improved effective management of CWD in captive cervid herds and free-ranging populations. Some of the most important CWD-related topics and issues that require

immediate and continued study include: determination of transmission routes, causative agent(s), and the potential of infection from environmental contamination (versus lateral animal to animal) in natural areas and captive facilities; potential for transmission to livestock, other wildlife, and humans; development of treatments and a live test for CWD; and the potential for reclaiming captive facilities and natural areas where CWD infection has occurred.

Knowledge gained from study of the relationships between deer densities, migration and dispersal, winter severity and nutritional condition to susceptibility of animals to CWD infection, transmission rates, and disease distribution will be critical to future management. Increased understanding of the influence of CWD prevalence on deer and elk mortality rates from other sources (e.g., wolf and bobcat predation, starvation, hunter-harvest), reproductive success, and on population growth rates will assist management in decision-making and planning optimum strategies over time. Ultimately, integrated field and modeling efforts will be necessary to determine the effectiveness of management intervention (e.g., intense surveillance, population reduction by hunter-harvest and culling) on prevalence and distribution of CWD among free-ranging populations.

5) Education and Information-Sharing

MNDNR will help educate and will share current information with the general public, constituent groups, and other agency personnel. Information and education will include website updates, distribution of brochures, periodic news releases, public meetings, or informational workshops, and agency communications and reports. This information will include: a basic history and understanding of CWD, its nationwide distribution, and status of knowledge of the disease (e.g., epidemiology, transmission, clinical signs, population effects); other CWD-related issues and concerns (e.g., carcass handling and meat consumption, transmission to humans and livestock, deer feeding); and management and research actions being taken by MNDNR and the Board of Animal Health. Information may also be designed to focus on specific issues of importance to hunters, meat-processors, taxidermists, deer feeders, and operators of captive deer and elk facilities.

Further, publication of technical findings of research in peer-reviewed journals and agency reports will be strongly encouraged. Chronic wasting disease is a management issue that will likely become more serious with time. The more informed all agencies and the public become, the more effectively CWD risks will be managed in the future.

Captive Cervids on MNDNR Licensed Game Farms

MNDNR has regulatory jurisdiction over approximately 1,100 licensed game farms, 366 of which have cervids (approximately 17,500 white-tailed deer and 600 elk). These game farms range from having just a few animals to large commercial operations.

Game Farm Regulation Weaknesses and Concerns

A number of weaknesses and issues have been identified involving game farm regulation,

licensee knowledge of regulatory requirements, and consistency of enforcement of those requirements. These issues have implications relative to potential CWD introduction into these game farms and transmission among captive and free-ranging white-tailed deer (and elk). Specific issues that have been identified include the following:

1) Game farm animal registration records and associated data (e.g., animal inventory, additions and losses from herds) have not been computerized. Consequently, game farm records are not easily accessible or amenable to the scrutiny necessary for effective monitoring and enforcement;

2) There are no specific fencing regulations for game farms with white-tailed deer and elk, other than that they be adequate to contain the animals; they lack specific height requirements and are inadequate for preventing contact between, or commingling of, captive and free-ranging cervids;

3) Escapes of captive deer or elk from game farms are not required to be reported;

4) There is no specific regulatory language prohibiting the intentional release of captive deer or elk into the wild;

5) There are no specific requirements for unique individual identification of captive deer or elk on game farms;

6) There is poor compliance with regulations requiring submission of reports, sales receipts, and accurate annual inventories (e.g., during the 1999-2000 and 2000-2001 license years, violation rates of 35-44% were detected);

7) There is poor compliance with disease testing requirements (e.g., tuberculosis, brucellosis) by captive deer operations prior to importing and exporting of animals;

8) There are no surveillance or testing requirements for CWD specific to game farms;

9) Accounts of sales by brokers and game farm auction houses are poor;

10) MNDNR licensed game farms were at times used as “emergency” type rehabilitation centers for orphaned wild newborn fawns; and

11) MNDNR Enforcement inspections of game farms have too often been inconsistent.

Much of the game farm regulatory language is antiquated and was formulated when game farms were primarily licensed for raising pheasants and other game birds, not cervids. Many of the regulations are vague or subject to various interpretations. The result is that in many violation cases, the benefit of the doubt often goes to the violator, and fines and penalties are often inadequate to be effective.

Proposed MNDNR Response to Game Farm Regulatory Concerns

Although chronic wasting disease has not been detected in captive or free-ranging cervids in Minnesota, evidence is mounting that the risk of CWD introduction into Minnesota captive cervid herds and free-ranging populations is increasing. This is particularly true in the absence of an effective CWD Surveillance Program for all captive cervids, including those under the regulatory jurisdiction of MNDNR. There is also need for a stepped-up geographic surveillance of free-ranging cervids (discussed previously).

Relative to MNDNR regulated captive cervid operations, proposed management needs of highest priority include:

1) computer entry and annual database maintenance of all registration data for all captive cervid operations, including total number of animals, species, sex, age, deaths, cause or death, movement of animals into and out of the operation, and records of disease testing (this action is underway);

2) strengthening fencing requirements to minimize the risk of ingress and egress of cervids and commingling of captive and free-ranging cervids at the fence;

3) specifically prohibiting intentional release of captive cervids and requiring immediate reporting of animals that have escaped;

4) requiring 2 forms of identification for each individual animal, 1 of which is permanent;

5) requiring CWD-testing of all animals that die, in addition to requiring reporting of all deaths;

6) clearly providing all game farm licensees with a summary of all regulatory requirements so that the laws and rules are comprehensible and compliance can be enforced.

MNDNR will work with other agencies and organizations in an attempt to comprehensively address the management of captive cervids under one uniform system. This will require a legislative initiative in the 2003 session. In the meantime, MNDNR will do what it can to strengthen importation and release provisions through existing rulemaking authorities.

Appendix A. Chronic Wasting Disease: Status of Our Knowledge

Occurrence and Distribution

Chronic wasting disease is a transmissible spongiform encephalopathy, which is a disease that alters the structure of the brain, particularly the gray matter, in a way that resembles a sponge-like appearance and texture. Much about CWD is still unknown, including its origin, exact mode of transmission, and the causative or etiological agent. The source of CWD may be related in some way to scrapie in domestic sheep; it may "represent a spontaneous, naturally-occurring" form of this disease in cervids thought to be caused by a " low virus infection." A more plausible theory is that CWD is caused by a point mutation of a membrane-bound protein resulting in accumulations of proteinase-resistant prion proteins (PrP^{res}) in the brain (medulla oblongata), tonsils (in deer only), and lymphoid tissue.

The only known long-term distribution of CWD in free-ranging cervids includes 2 contiguous local areas in northeastern Colorado and southeastern Wyoming. Up to15% and a less than 1% prevalence were reported for mule deer and elk, respectively, in certain management units. Two cases of CWD occurred in mule deer in the southwestern corner of the panhandle of Nebraska, which is close to the endemic area of Colorado and Wyoming. Both of these latter animals were close enough to have originated from the endemic area. More recently, CWD was diagnosed in 88 white-tailed deer within and outside a fenced pasture of a captive operation where elk were diagnosed with the disease. Infections in captive elk also have been documented in Colorado, Wyoming, Montana, Oklahoma, South Dakota, and Kansas. In early 2002, CWD was detected in free-ranging white-tailed deer in South Dakota (1 deer) and Wisconsin (3 deer). Cases of CWD have been documented in captive elk and free-ranging mule deer in Saskatchewan as well.

Incubation, Transmission, and Clinical Course of CWD

Incubation time, time from infection to appearance of clinical signs, typically is less than 2 years (18-24 months). However, incubation time can be variable and ranges up to 36 months. The exact mode of transmission of CWD is unknown; however, circumstantial and experimental data indicate *horizontal* (or lateral) transmission in captive cervids and domestic sheep - either by direct animal-to-animal contact or by environmental contamination. For cervids, the routes of transmission are *presumed* to be by exposure to saliva, urine, feces, or placental tissue, with infection occurring through the alimentary canal (mouth/nose→ esophagus→ stomach→ intestines). If this transmission mode is confirmed for free-ranging cervids, then it follows that practices such as artificial feeding that unnaturally concentrate free-ranging deer or elk could potentially exacerbate the risk of infection. In contrast to outbreaks of mad cow disease, where exposure to animal protein-contaminated feed was documented, this has not been the case for captive or wild cervids infected with CWD. Presently, feed contamination is not considered a likely underlying transmission mechanism. Whereas, the importance of maternal transmission (mother to fetus or nursing young) as a mode of scrapie transmission in domestic sheep has at least been debated, its importance relative to CWD persistence in captive and wild cervid herds

has been contraindicated thus far by current reports. Although the route of agent shedding from infected individuals is presently unknown, it is believed that the rate of agent shedding may very well increase as the disease progresses. Thus far, evidence also indicates that there is no difference between males and females or across age classes in susceptibility to CWD.

Importantly, *natural* transmission of TSEs (i.e., BSE, CWD) between domesticated bovids (i.e., cattle, bison), sheep and cervids has not been documented. Deer, domestic cattle and sheep have been *experimentally inoculated* with brain tissue containing PrP^{res} from CWD-infected mule deer, and 2 years later, only the deer have become infected with CWD. However, healthy deer have been inoculated with brain tissue from scrapie-infected sheep, and the deer did develop CWD.

The clinical course of CWD is about 12 months. That is, once clinical signs are apparent, cervids rarely survive more than 12 months. Chronic wasting disease is a progressive, fatal disease, with no vaccine to prevent the disease or treatment for reversing the disease (recovery), and there is no evidence of immunity. There has been no effective, practical antemortem (live-animal) test for diagnosis until recently; a live-test for deer (not elk) involving tonsil biopsy and immunohistochemical analysis for PrR^{res} accumulation has demonstrated promise, and may be more sensitive than the post-mortem analysis of the obex of the medulla oblongata in the brain. The practicality of this test remains to be decided.

Clinical Signs of CWD

All signs or symptoms of CWD do not occur in all cases, and many of these signs are symptoms of other diseases and conditions as well. Further, the occurrence and severity of symptoms will depend in part on the stage (*early* versus *advanced*) of the disease. Below is a comprehensive list of the clinical signs of CWD: (1) loss of fear of humans; (2) nervousness or hyperexcitability; (3) teeth-grinding; (4) ataxia or loss of coordination; (5) notable weakness; (6) intractability; (7) inability to stand; (8) rough dull haircoat; (9) excessive salivation; (10) flaccid, hypotonia of the facial muscles; (11) drooping of the head and ears; (12) excessive thirst (polydipsia); (13) excessive urination (polyuria); (14) esophageal hypotonia and dilation, difficulty swallowing, and regurgitating ruminal fluid and ingesta; and (15) severe emaciation and dehydration.

It is important to note that while some primary symptoms may be directly related to CWD, others may be secondary, more of a consequence of the deteriorating body condition (emaciation) and related physiology (e.g., pneumonia, abscesses, enteritis, or internal parasitism that often accompany emaciation).

Pathological Signs of CWD

Pathological signs of the disease include: (1) emaciation associated with absence or serous atrophy of subcutaneous and visceral adipose tissue or fat, and yellow gelatinous bone marrow; (2) subacute to chronic bronchopneumonia; (3) digestive tract (abomasal or omasal) ulcers; (4) enlarged adrenal glands; (5) watery or frothy rumen contents; and (6) histological lesions. These lesions have primarily and most consistently been observed in the brain and spinal cord. (7) Immunohistochemistry (IHC) is very sensitive and specific to CWD and is typically used to confirm diagnoses by measuring accumulations of proteinase-resistant prion protein (PrP^{res}) in brain tissues (specifically in the obex of the medulla oblongata) of infected deer and elk. This prion protein is antigenically indistinguishable from the scrapie-associated prion protein (PrP^{Sc}) found in brain tissues of domestic sheep infected with scrapie, but other differences have been noted. PrP^{res} has *not* been detected in uninfected cervids. This test can detect CWD infection before lesions are observable; however, IHC(+) results are not detected until at least 3 months after infection. Lesions do not always accompany PrP^{res} accumulation and IHC(+) results. (8) Scrapie associated fibrils (SAFs) have been observed by electron microscopy in the brain tissue of infected cervids, but not in uninfected cervids. (10) Generally, blood (whole blood and serum) and urine profiles have remained within the normal range, with the exception that certain characteristics have reflected the emaciated condition of the infected animals. Low specific gravity of the urine, is the one urine characteristic that may be directly related to CWD, specifically to degenerative encephalopathic changes in the hypothalamus. The hypothalamus is important in regulating antidiuretic hormone, which influences concentrations of urinary electrolytes (e.g., Na) and osmolality.

Appendix B. Status of Captive Elk and Deer Operations, Regulatory Authority, CWD Infections, and Management in Other Select States

Colorado

There are 146 elk ranches in Colorado, accounting for 15,000 elk (12,000 adults, 3,000 in the 2001 calf crop). Approximately 90% of the elk operations are registered with the Department of Agriculture. No deer are registered with the Department of Agriculture. The other 10% of the operations include elk and mule deer and are registered with the Division of Wildlife as shooting preserves. Presently, there is no CWD surveillance program or individual animal identification requirement in place for the operations registered with the Division. There are only 6-7 captive deer operations in the entire state, comprised of about 200 deer, that are registered with the Division of Wildlife. The Division has minimal management responsibility of captive operations, except involving site and report reviews.

The earliest detection of CWD in captive deer occurred in a wildlife research facility in Fort Collins in 1967. Since then, additional infections have been identified in deer and elk in that research facility, as well as in another in southeastern Wyoming. Thus far, 15 positive cases of CWD have been identified involving 9 licensed (i.e., commercial) captive operations. This includes elk that had been traced out to 38 other operations from the operations within the endemic area where the original infections were detected. Elk from the herds originally infected also have been traced to commercial herds in North Dakota, South Dakota, New Mexico, Utah, Minnesota, Wisconsin, Texas, Oklahoma, Idaho, Indiana, Illinois, Kansas, Missouri, Nebraska, and Pennsylvania. All exposed elk in each state have been identified and CWD-tested, or are at least under quarantine.

Approximately 1,550 elk are involved in the 9 CWD-infected operations in Colorado. Some large herds, such as the Stoneham (700 elk), actually involved 4 licensed operations. Overall, the 9 operations are located from northeastern (within the endemic area) to southwestern Colorado**.** Management responses of the Department of Agriculture have ranged from quarantine to complete depopulation of exposed herds. The captive facility currently of greatest concern is the Del Norte elk ranch with 400 animals. The Division of Wildlife's concern for protecting free-ranging cervids in the surrounding vicinity prompted them to pay $40,000 for double-fence construction around the facility. This is a temporary measure; all of the exposed herds are slated for depopulation once federal indemnity funds become available. During December 2001, the Division was considering supporting the $100,000 cost for a double fence around another captive elk facility located outside the endemic area, but Rick Kahn, Terrestrial Field Operations Manager, was not optimistic that support ultimately would be provided by the Division.

Chronic Wasting Disease in Free-Ranging Elk and Deer

Chronic wasting disease was first diagnosed in free-ranging cervids in a contiguous area of northeastern Colorado and southeastern Wyoming in 1981, but from then to 1995, a total of 49 cases (41 mule deer, 6 elk, and 2 white-tailed deer) have been documented. Subsequently, CWD has affected up to15% of free-ranging mule deer and 1% of elk in certain local management units within this endemic area. Overall within the endemic area (15,000 mi^2 or 5,790 km^2), CWD prevalence has been estimated at 4.9% for mule deer, 2.1% for white-tailed deer, and 0.5% for elk.

Chronic Wasting Disease Surveillance Programs

In May 1998, Colorado was one of the first states to adopt a CWD Surveillance Program. The surveillance and importation components of their program are mandatory for all elk operators registered with the Department of Agriculture. That is, for all alternative livestock (i.e., all cervids), regardless of age, all mortalities must be reported and a brain stem submitted for IHC-testing for CWD. The importation component also applies to all cervids, and for the first 18 months of the program, requires that animals may only be imported from herds that have been under surveillance for CWD for at least 36 months. Over the next 2 years, the minimum surveillance requirement for herds being imported from, will be increased to 60 months. The "status" component of the CWD Surveillance Program is voluntary, but it is important to each operation's ability to export elk, because many other state CWD Surveillance Programs will restrict importing to elk from herds that have attained specific CWD Surveillance Program status or certification. This part of the program requires annual inventories and inspections of the elk operations. The Department of Agriculture is also working to change the rule addressing fencing of captive operations to ensure that the fencing is "effective." The Department believes that strict individual animal identification regulations, annual inventories and inspections of operations and records will help it determine the effectiveness of fences. Importantly, the Department of Agriculture recently purchased an "air-curtain incinerator" ($46,000) to provide for thorough disposal of CWD-infected carcasses. This incinerator burns at 1,700-2,800^o F; at least 1,500^o F is required to adequately destroy the PrP^{res} accumulations in CWD-infected cervids.

The Division of Wildlife and Colorado Wildlife Commission have adopted a long range comprehensive CWD policy. The policy addresses numerous critical issues, including: (1) disease management (i.e., minimize the potential for the CWD to spread beyond the endemic area and reduce the current prevalence of CWD in the endemic area), (2) development of Data Analysis Unit (DAU) plans for the endemic area, (3) research, (4) the role of hunting in the endemic area, (5) hunter information (e.g., human health), (6) use of Division staff to remove animals from the endemic area for management and/or research, (7) testing of animals killed in the endemic area, (8) the role of the Department of Agriculture in CWD management, (9) movement of live animals (under Division of Wildlife jurisdiction), (10) removal and disposal of carcasses from the endemic area, and (11) communication. Details of these policy components re being considered for selective inclusion in the MNDNR Division of Wildlife's CWD

Management Plan.

A critical part of the Colorado Division of Wildlife's management policy for CWD has been aggressive targeted surveillance and culling of deer and elk exhibiting clinical signs consistent with CWD, followed by IHC-testing of brain samples and tonsils (useful in deer only) for CWD. Geographically-focused random surveys, involving more than 5,500 sampled deer and elk have also been conducted within and outside the endemic area to determine prevalence and spatial distribution of affected animals. During 2002, the Division plans to cull and CWD-test 700-1,000 cervids. The Division disposes of carcasses in 2 ways. Most go to a landfill (in the endemic area) after being double-bagged. Other carcasses go to the laboratories at Colorado State University and the University of Wyoming for incineration according to recommended standards. Additionally, Colorado is considering regulations that would strictly prohibit the transport of wild or domestic cervids out of the endemic area and permit only skull plates and antlers that have been sufficiently cleaned to be taken from this area.

Nebraska

There are 106 captive elk/deer operations in Nebraska that include approximately 4,000 elk. White-tailed deer and mule deer are not permitted to be maintained in captivity in Nebraska; exotic cervids are allowed. There are 1-2 small captive white-tailed deer and 5-6 mule deer operations that were grandfathered in. These deer operations can not import deer, but they can export their deer. In 1997, the Nebraska Department of Agriculture received all management responsibility, including enforcement (e.g., monitoring, inspections), for all captive cervids.

Chronic wasting disease infection has been detected in 3 commercial elk/deer operations in northwest Nebraska, not far from the endemic area of northeast Colorado-southeast Wyoming. The earliest was a facility with very good records, and the infection was detected before CWD was receiving much attention. One elk exhibiting clinical signs of CWD was put down and tested positive. The total herd included about 130 elk. Eighty to 100 elk were shot, and because they all tested negative, and because the records were very thorough, the only other action was a 3-year quarantine. The second CWD infection was identified in a small herd of 15 elk, and the entire herd was depopulated. In the third, and most recent operation (Edwards' elk facility) tested, 8 of 80 elk and 11 of 21 white-tailed deer were CWD-positive, initially. There is strong circumstantial evidence that the infected deer were free-ranging animals that were attracted and corralled into one of the adjacent fenced pastures by the operator before the first infections in elk were diagnosed; subsequently the deer had contact with the infected elk. The elk herd is quarantined and are slated to be depopulated as soon as additional federal indemnification funds are available. In an attempt to determine the source and spatial limit of CWD in free-ranging deer in and around the Edwards' operation, the Commission of Game and Parks conducted additional deer drives (with culling) during the week of 9 January 2002, collecting an additional 79 brain stems for CWD-testing. Thirty-seven and 42 samples were collected from deer inside and outside the Edwards' fenced pasture, respectively. As of 24 January 2002, test results showed 17 of the 37 brain samples tested IHC(+) for CWD. However, as of 29 March 2002, 79

of a total 154 (51.3%) white-tailed deer, shot within the fenced pasture and tested, were CWD (+). Nine of 113 (8.0% infection rate) deer collected by the Nebraska agency from outside the fenced pasture tested positive for CWD. During early March 2002, a cooperative culling and CWD (-testing effort with South Dakota resulted in all CWD (-) results for 103 deer collected on the Nebraska side of their mutual border. According to Nebraska officials, this is narrowing the focus of CWD in northern Sioux County, Nebraska, to an area within 10 miles of the Edwards' captive operation.

Between 1997 and 1999, the Game and Parks Commission conducted a modest survey of free-ranging deer by collecting 80 brain stems from hunter-harvested animals in southwest Nebraska. All tested negative for CWD. In 2000, 750 additional heads collected by hunter-harvest and tested, yielded 1 mule deer positive for CWD. A second IHC(+) mule deer was identified when the Commission culled another 150 deer in the panhandle. Of 300 samples collected from free-ranging deer during 2001, 299 were IHC(-), but 1 IHC(-) for the brain sample, was IHC(+) for the tonsils. (In deer, the PrP^{res} accumulates in the tonsils earlier than in the brain.) This deer was shot within 7 miles of the 2 IHC(+) free-ranging mule deer tested in 2000. Results for an additional 500 brain stem samples being tested at the University of Wyoming have not been received yet. To date, the Nebraska Game and Parks Commission has culled (not including brain stems from hunter-harvested deer) and tested (or in the process) 309 deer for CWD. Although the Commission considered burying carcasses of culled deer at a landfill, disposal by incineration was chosen when the alternative was made available at the nearby Universit'=s Veterinary School. According to Bruce Morrison, the Commission plans to purchase an air-curtain incinerator this year for future carcass disposal.

Chronic Wasting Disease Surveillance Program and Importation

The Department of Agriculture has a CWD Surveillance Program, which applies to *elk only*. Major components of their program include: (1) definitions of commonly used terms (e.g., affected herd, trace-back herd, trace-forward herd, etc...) that conform with the National CWD Surveillance Program (to be implemented in summer 2002), (2) requirements for entry into the program, (3) program protocol (General Provisions, Inspections, Program Status, Management of CWD Affected or Exposed Herds, Acquisitions and Commingling, Use of Semen and Embryos, Animals Imported from Foreign Countries), (4) herd information, and (5) laboratory submission of samples. This latter part requires that all deaths of captive cervids at least 16 months of age must be reported and brain stems IHC-tested for CWD.

Currently there is a broad ban on most cervid importation. Importation is prohibited for *any cervids* from Colorado and Saskatchewan, and from any herd that has received animals from these states within the past 5 years. Importation is also banned for any cervids from any facility that has had a CWD-positive or exposed animal during the past 5 years. Furthermore, cervids imported into Nebraska must have been enrolled in a CWD Surveillance Program for a least 36 months, and an imported animal must be accompanied by documentation of its complete history to its birth herd. Imported cervids are isolated until a state veterinary representative confirms

that the identification numbers agree.

The Game and Parks Commission formulated a CWD Management Plan which includes 4 broad areas of action to address critical issues related to CWD in free-ranging deer and elk. The areas of action are: (1) informing and educating the public (including hunters), constituents (e.g., wildlife producers, meat processors, taxidermists), NGPC and other agency personnel (e.g., local, federal) concerning CWD; (2) limiting distribution of CWD in deer and elk (e.g., (a) preventing inadvertent movement of CWD-infected wild deer and elk and inadvertent introduction of CWD into captive cervid operations, (b) continue field investigations and surveillance to monitor changes in prevalence and distribution of CWD cases); (3) reducing prevalence of CWD in local free-ranging deer and elk populations (e.g, reduce the potential for CWD transmission; and (4) conduct and support research on epizootiology and management of CWD (e.g., transmission routes, live-test for CWD, treatment, modeling to examine effects of CWD on affected populations, and effectiveness of management responses).

South Dakota

South Dakota has 50-60 herds of about 1,500 captive elk and 100-300 captive deer. Until 1992, no state department had actual jurisdiction over the captive cervid operations, and the existing laws were vague. In 1992, the Animal Industry Board (AIB) of the Department of Agriculture gained responsibility for *all* captive cervid operations. Since1997, South Dakota has had numerous CWD "hotspots," and AIB initiated a CWD Surveillance Plan for captive cervid operations statewide. Ten elk herds were quarantined initially. The quarantine means that no elk movement is permitted into or out of the facilities for at least 5 years. However, because subsequent tests showed that the herds were exposed to CWD-infected or high risk animals, all 10 herds were depopulated. Bear Country, in Rapid City, was one of 3 operations owned by the Casey family in South Dakota that had CWD-infected elk, and it was placed under quarantine. The Bear Country site was permitted to re-open to the public while under quarantine, but only after double-fencing was constructed.

Chronic Wasting Disease in Free-Ranging Elk and Deer

Until recently only 1 white-tailed deer in captivity had tested IHC(+) in South Dakota. It was among some wild deer fenced into a "buffer pasture" adjacent to a captive operation with a CWD-infected elk herd, which it is believed infected the deer. In a collaborative (1997-1999) effort to determine the risk of CWD infection in free-ranging cervids, the South Dakota Department of Game, Fish, and Parks (DGF&P); South Dakota State University; and AIB collected heads from a total of 128, 519, and 368 hunter-harvested mule deer, white-tailed deer, and elk, respectively, in geographically-focused surveillance areas throughout the state. All brain stem samples tested negative for CWD. No collection or testing of heads from free-ranging cervids was conducted during 2000; however, the survey was resumed in fall 2001 when 500 additional elk and deer heads were collected. About 400 of these brain stems were collected in southwestern South Dakota. In early February 2002, 1 of these was reported to be CWD(+);

however, all brain stems have not yet been tested. This CWD(+) was from a white-tailed deer shot in the northeastern part of Fall River County, about 10 miles east-southeast of Hot Springs, which is about 26 miles north of the Nebraska border. However, it is about 50 miles northeast of the CWD-infected (elk and deer) Edward's Ranch (in Nebraska). During late February, South Dakota began its first culling and testing operations. Ninety deer were collected in southwestern South Dakota, not far from where CWD(+) deer were detected in Nebraska; all tested CWD (-). Additional culling and testing is planned 25 miles further west, closer to where the South Dakota CWD-infected white-tailed deer was shot; sample size for that culling has not yet been determined. Presently, South Dakota is disposing of carcasses in the Rapid City landfill, as per the advice of their State veterinarian.

Chronic Wasting Disease Surveillance Program and Management Policy

South Dakota AIB's CWD Surveillance Program is similar to Minnesota's program in that it basically (1) requires annual herd inventories; (2) requires surveillance and CWD-testing of animals that have died, are slaughtered, or are destroyed after exhibiting symptoms consistent with CWD; (3) designates herd status based on years of monitoring in the program; and (4) imposes rules for importing and adding cervids to a captive herd. Importation of cervids into South Dakota requires specific written certifications addressing each anima's herd and movement history, and documentation of herd monitoring demonstrating that the animal has not been exposed to CWD in any herd (i.e., trace-back or trace-forward within the past 5 years).

According to this program and supportive statutes/rules, cervids that have escaped from a captive operation must be reported immediately and become the property of AIB. The AIB determines whether the animal, if captured, is returned to the permittee or transferred to the DGF&P. Typically, if an animal escapes, the owner has 2-3 days to capture it before the DGF&P can take action. However, if an elk or deer escapes from a CWD-infected or exposed herd, then the DGF&P can destroy the animal immediately.

Before issuance of a permit to operate a captive cervid facility, the AIB and DGF&P may inspect the facility and must be satisfied that it does not include any free-ranging cervids. If free-ranging cervids have been fenced in, they must be removed at the owner's expense before a permit is issued. Disposal of the animals is decided by AIB and DGF&P.

South Dakota's DGF&P has not adopted a formal CWD management policy, rather, they have taken an "*operational approach*." At this point, according to Ron Fowler (Wildlife Program Administrator), "whatever is needed, funds, travel to meetings for information gathering, cervid brain stem collections and CWD-testing, etc..., the agency will support to manage CWD."

Wisconsin

In Wisconsin there are about 272 captive elk operations (total of 10,815 elk), 56 exotic deer operators, and 575 white-tailed deer farms (total of 17,500 deer). During the mid-1990s,

registration and management responsibilities for captive elk, red deer, and all other exotic cervids were transferred from the Wisconsin Department of Natural Resources (DNR) to the Department of Agriculture. The DNR retains management responsibility for the white-tailed deer farms. If an operation has white-tailed deer and elk (or other exotic cervids), then it must register with the DNR and the Department of Agriculture. New captive wildlife legislation has been proposed, and if approved, would transfer management responsibility of captive white-tailed deer to the Department of Agriculture as well.

CWD Surveillance Program and Management Policy

The Department of Agriculture has had a draft or pilot CWD Surveillance program for about 1 year. It is voluntary, and 60 elk operators and 1 red deer operator are currently enrolled in the program. The CWD program has 2 surveillance options. One requires that brain stems from all dead elk and exotic deer at least 16 months old, regardless of cause of death, must be submitted for CWD-testing. The second option requires that brain stems from all dead elk or exotic deer between 16 and 30 months old must be submitted for CWD-testing, unless used for slaughter purposes only (red deer operators do a lot of slaughtering). However, under this option, brain stems from all dead elk and exotic deer greater than 30 months old must be submitted for CWD-testing, regardless of cause of death. Thus far, there have been 78 captive elk brain stem submissions that have all tested negative for CWD.

Enrollees in this CWD program also must submit an annual herd inventory that includes all animals. The inventory must include official identification and all ancillary identification for all animals at least 1 year old; total number of elk or exotic deer less than 1 year old, where official identification is only required in a case of change of ownership; the specific age of each animal (e.g., “adult’ not acceptable); and the length of time each animal has been in the herd. Finally, captive herds must be “routinely” observed by the operator’s veterinarian to check for animals exhibiting clinical signs of CWD, and if detected, these animals must be reported within 72 hours to the Division of Animal Health.

Until recently, there have been no bans or extraordinary restrictions on importation of deer, elk, or exotic cervids into Wisconsin. All elk imported into Wisconsin from infected herds in Colorado have been traced, and all but 2 have tested negative for CWD. The final 2 elk and the captive herds they are part of have been quarantined; these animals are to be tested. If they are negative the quarantine will be removed, and if they are positive, the herds will be scheduled for depopulation. As of 20 March 2002, the Department of Agriculture announced that as part of the requirements for an importation permit, only *cervids (deer, elk, and exotics)* from captive facilities that have been participating in a CWD Surveillance Program for 5 years will allowed into Wisconsin. In essence, this will close their borders to importation of captive cervids, because the longest any captive facility has been under CWD surveillance is about 3 years.

The Wisconsin DNR has some documentation of plans for managing against CWD in free-ranging deer and elk, but nothing that has been formally approved as an agency policy. The DNR has been conducting targeted surveillance and geographically-focused random surveys to

determine if CWD is present in free-ranging deer. During the past 2 years efforts have included up to 650 brain stems collected from hunter-harvested deer, "suspect" deer, and some urban deer taken by sharp-shooters during winter. Most of the sample collection was focused around elk ranches known to have received animals from Colorado, specifically from ranches known to be CWD-infected. All of these were IHC(-) for CWD. During fall 2001, the DNR collected about 550 brain samples from hunter-harvested deer brought to check stations in areas known to have high numbers of deer taken and where there has been no sampling effort previously. All analyses are being conducted at the National Veterinary Services Laboratory in Ames, Iowa. Tests for all of the brain samples have not been completed, but during early March 2002, the DNR reported CWD infection (positive tests) for 3 male white-tailed deer that had been shot within 1.5-2.5 miles of one another, Deer Management Unit 70A, in portions of Dane and Iowa counties. These bucks were 2.5-3.0 years old. In response, the Wisconsin DNR established a surveillance area of 415 square miles surrounding the area of initial CWD discovery, and set a sampling goal of 500 deer to be culled and tested in the surveillance area. By early April 2002, 414 deer had been culled for testing, 197 samples had been tested, and 7 samples were positive for CWD. All of the additional CWD positive animals were within 5 miles of the original site of CWD discovery.

Michigan

There are approximately 900 captive cervid operations with 1-100s of deer and/or elk per facility. Doug Hoort (DVM, Department of Agriculture) estimates that there are about 200 elk operations with a total of 3,000-4,000 elk. According to Hoort, their records are not very organized, and consequently, much of the information is not readily accessible. Approximately, 2 years ago, a number of management responsibilities (e.g., disease monitoring, inspections) for all captive cervids were transferred to the Department of Agriculture. The Michigan Department of Natural Resources (DNR) had retained regulatory authority over the facilities of the captive operations. However, as of June 2000, all regulatory responsibility has been turned over to the Department of Agriculture. The transition is based on the 3-year permit period for the captive operations, so that by June 2003, all operations registered (or renewed) after June 2000, will be under the regulatory authority of the Department of Agriculture. The Departments of Natural Resources and Environmental Quality are still responsible for assessing the impact of new facilities on wildlife and their habitat and for assuring that no free-ranging animals are enclosed within the fenced pastures of new operations. If a captive cervid escapes, the official response may involve a joint effort of the Department of Agriculture and the DNR to capture the animal. If free-ranging animals are directly involved, then the DNR assumes primary enforcement responsibility. Hoort recognizes that there is some concern in the DNR regarding Agriculture's enforcement abilities relative to the captive operations; however, he anticipates that as their TB program winds down, greater attention will be refocused on CWD-monitoring efforts.

CWD Surveillance Program and Management Policy

To date, all tests for CWD in captive cervids have been negative. The Department of Agriculture is developing their state CWD Surveillance Program, and they are planning to

participate in the National CWD Surveillance Program. Michigan is modeling their CWD program after the federal program; however, they are considering strengthening certain aspects of their plan that they believe might be too weak in the federal program.

Currently, the Michigan DNR does not have an official CWD management policy. However, the agency has been conducting a targeted surveillance program, so that brain stems are collected from all free-ranging Asuspect@ deer and elk and are tested for CWD. Further, the DNR collected about 450 brain stems from hunter-harvested deer in 1998-1999 and had them examined for CWD. However, there may be a flaw in their testing procedure. Initially, they have the brain samples examined at a nearby university pathology laboratory for lesions *commonly* associated with CWD infection, then if lesions are present, they have the samples IHC-tested for PrP^{res} at the National Veterinary Services Laboratory in Ames, Iowa. The problem is that the IHC test is the more sensitive and definitive test, and brain lesions do not always accompany CWD infection or IHC(+) results. Thus far, all samples tested by their procedure have been determined to be negative; however, it is possible that some of the samples which did not exhibit lesions, might have been IHC(+) had they been tested.

While the Michigan DNR continued targeted surveillance and CWD-testing for suspect deer and elk, it did not continue random surveys (i.e., brain samples from hunter-harvested deer) during 2000 or 2001. Further, unless an infection is detected in a captive facility, the DNR will probably refrain from additional CWD surveys. If CWD is detected in a captive herd, then the DNR would probably resume brain stem collection from hunter-harvested free-ranging deer and elk focusing the survey efforts within a pre-determined radius of the operation with the infected herd. Generally, if CWD is detected in free-ranging deer or elk, the DNR plans to "implement strategies aimed at preventing spread of the disease and reducing its occurrence in affected deer and elk herds." Since announcement of the 3 CWD-infected free-ranging male white-tailed deer in Wisconsin, Michigan's Department of Agriculture instituted a ban on all cervid (deer and elk) imports from Wisconsin, which will remain in effect until more is known "about the scope and range of the disease in Wisconsin" (Dr. Joan Arnoldi, Michigan State Veterinarian and Director of the Department of Agriculture's Animal Industry Division).

Other States and Canadian Provinces

A summary of CWD incidence in captive and free-ranging cervids, CWD surveillance programs, and CWD management policies was not included for all states. However, since 1989, CWD infection of captive elk also has been reported for Oklahoma, Montana, most recently in Kansas, as well as in at least 31 herds in Saskatchewan. Evidence indicates that all of the positive captive elk in Saskatchewan were traced back to one Canadian herd that had imported CWD-infected elk before 1990 from a U. S. herd that was subsequently diagnosed with CWD. Additionally, CWD-infected free-ranging mule deer in Saskatchewan have also been reported. Recently, in response to reports of CWD in free-ranging cervids in Nebraska and Colorado, the Texas Animal Health Commission prohibited importation of deer and elk into Texas from those states. Subsequent to detection of CWD in free-ranging deer of Wisconsin, the Texas Parks and Wildlife Commission voted to ban importation of *all* white-tailed deer into Texas.

Sources of Information

The basis for this document is information derived from interviews with and documents from the following: Russ Bay (DVM, Veterinary Diagnostic Laboratory, University of Minnesota), Scott Bradley (Conservation Officer, Minnesota Department of Natural Resources), Jim Collins (DVM, Veterinary Diagnostic Laboratory, University of Minnesota), Lynn Creekmore (DVM, USDA Veterinary Services), Wayne Cunningham (DVM, Colorado Department of Agriculture), Ron Fowler (Wildlife Program Administrator, Division of Wildlife, South Dakota Department of Game, Fish, and Parks), Douglas Hoort (DVM, Michigan Department of Agriculture), Rick Kahn (Terrestrial Field Operations Manager, Colorado Division of Wildlife), Terry Kreeger (DVM, Wyoming Game and Fish Department), Julie Langenburg (DVM, Wisconsin Department of Natural Resources), Joseph Marcino (Fish and Wildlife Pathologist, Minnesota Department of Natural Resources), Michael Miller (DVM, Colorado Division of Wildlife), Bruce Morrison (Nebraska Game and Parks Commission), Kristina Petrini (DVM, Minnesota Board of Animal Health), Dan Obrien (DVM, Michigan Department of Natural Resources), D. O'Conner (DVM, Wisconsin Department of Agriculture), Elizabeth Williams (DVM, Department of Veterinary Services, University of Wyoming), and a number of others.

Appendix C. Minnesota Board of Animal Health's CWD Surveillance Program for Elk

The Minnesota Board of Animal Health's CWD Surveillance Program consists of 4 basic elements (copied from BAH 2001): herd inventory, surveillance, herd status levels, and herd additions.

Herd inventory requires that (1) the first inventory be completed prior to program entry, (2) annual inventories are conducted 9-15 months from the entry date, and (3) a veterinarian licensed and accredited in Minnesota must conduct all inventories.

Surveillance requires that (1) the brain of all cervids (elk, deer, etc...) at least 16 months of age that die or are slaughtered are to be submitted by a veterinarian to the University of Minnesota Veterinary Diagnostic Laboratory for CWD testing (appropriate samples will be forwarded to an accredited laboratory, e.g., as in Ames, Iowa), and (2) a copy of the laboratory report must be submitted with the annual herd inventory.

Herd status levels are: Level A, first year of participation; Level B, second and third years of participation; Level C, fourth and fifth years of participation; and Level D, at the end of the fifth year of participation.

Herd additions are allowed only from herds of equal or greater status. Addition of an elk from a herd of lower status, reduces the herd receiving that individual to that lower status.

All costs associated with herd inventory, surveillance, and laboratory analyses for CWD are at the owner's expense. Although the current CWD Surveillance Program was initially designed for elk only, the BAH does have 2 and 11 captive deer and deer/elk operations, respectively, enrolled and participating in the program. It is noteworthy, that the captive deer or elk operations do not have to be registered with the BAH to voluntarily enroll in the program. Further, if a BAH-registered captive cervid operation includes deer and is enrolled in the CWD program, then the brain of *any cervid* at least 16 months old that dies or is slaughtered must be submitted for CWD testing. Also, BAH requirements and jurisdiction apply regardless of where CWD infection is detected. The determining factor is not species, but rather whether the disease is considered a threat to livestock. Consequently, if an elk or deer on a game farm registered with the DNR is diagnosed with CWD, then the BAH has the responsibility and authority to act, ranging from quarantining the herd/facility of the infected animal to complete depopulation. Of course, a primary weakness in current management systems, particularly for the DNR-registered game farms, is whether deer exhibiting signs of CWD infection will be detected, reported, and tested.

Currently, the BAH does not strongly encourage enrollment into their CWD Surveillance Program by captive deer operations for the following reasons:

1) there have been no reported cases of CWD infection in captive deer; therefore the *perceived* threat of infection is less than for elk,

2) the deer farming industry is not showing support for a CWD monitoring program, and

3) funds and personnel are insufficient to implement and enforce an expanded CWD Surveillance Program that includes the captive white-tailed deer game farms of Minnesota.

Appendix D. National Chronic Wasting Disease Surveillance Program

In 1998 and 1999, the United States Animal Health Association (USAHA) passed resolutions to endorse development of a federal CWD monitoring/surveillance program. In late 1999, representatives from numerous agencies and interest groups, including Veterinary Services of the USDA's Animal and Plant Health Inspection Service (APHIS), state Departments of Agriculture, Departments of Wildlife, federal and state diagnostic laboratories, producer associations (e.g., North American Elk Breeders Association) and others met to formulate an initial draft of this program. In late 2000, USAHA endorsed continued development of the earlier draft and a final version has now been proposed for approval. The goal of the National CWD Program "... is to eradicate CWD from captive *elk* herds in the U. S." Most of the state CWD surveillance programs already in existence apply to all cervids, and even though aspects of many of these CWD programs were considered in formulating the national program, the latter applies only to captive elk and elk hybrids. Though states may apply the federal program's "... surveillance methods to all cervids, the monitoring, reporting, certification, and indemnification aspects of the national program apply only to captive elk." Standards of state programs must be at least as stringent as standards of the national program. USDA/APHIS will permit interstate movement of captive elk only from herds enrolled in a CWD certification program.

Generally, technical elements of herd certification in the National CWD Program include:

(1) fencing effective for reducing the risk of transmission between captive and free-ranging cervids;

(2) approved@ or certified collectors of brain stem samples (i.e., obex of medulla oblongata) for testing;

(3) annually verified herd inventories, separate registration and maintenance of herd subunits that are managed independently;

(4) animal identification by 2 approved forms (one being an ear tatoo);

(5) precise geographic identification of operation premises;
(6) laboratories certified for CWD-testing by the National Veterinary Services Laboratory in Ames, Iowa; and

(7) 60 months required as the quarantine period, as well as the time-frame for trace back/trace forward investigations.

Standardized herd designations, terminology, and definitions of the National CWD Program are important to assuring thorough and uniform understanding of the numerous requirements of the certification process, herd designation, herd investigations and herd plans, which are critical to minimizing the risk of CWD transmission with movement of captive animals between operations. A herd plan describes the necessary actions to be taken by a captive elk (cervid) operator in response to identification of a suspect, CWD positive, or exposed herd and is based on a comprehensive epidemiological investigation and risk assessment by state/federal officials. Elements of a herd plan may include whole herd depopulation, quarantine, reproductive control, selective culling and testing of animals, continued surveillance, fencing, and others. Standardized terminology and definitions are provided below (from USAHA document, 2001); detailed explanations of herd designations may be provided upon request.

Term	**Definition**
Animal	Domesticated or captive white-tailed deer, mule deer, elk, or exotic deer.
Animal, CWD exposed	An animal that is, or has been in the last 5 years, part of a CWD positive herd.
Animal, CWD positive	An animal that has been diagnosed with CWD by means of an official CWD test conducted by a laboratory certified by USDA/APHIS.
Animal, CWD negative	An animal that has tested negative for CWD by means of an official CWD test conducted by a laboratory certified by USDA/APHIS.
Animal, CWD suspect	An animal for which laboratory evidence or clinical signs suggest a diagnosis of CWD.
Captive	Animals that are privately or publically maintained or held for economic or other purposes within a perimeter fence or confined space. Animals that are held for research purposes are not included.
Certification	A program of surveillance, monitoring and related actions designed to provide a status to captive deer and elk herds relative to chronic wasting disease.
Cervid	All members of the cervidae family and hybrids including deer, elk, moose, caribou, reindeer, and related species.

Chronic wasting disease	A transmissible spongiform encephalopathy (TSE) of cervids.
Commingling	Animals that have direct contact with each other, have less than thirty (30) feet of physical separation, or that share management equipment, pasture, or water sources/watershed. Animals are considered to have commingled if they have had such contact within the last 5 years.
Enrollment date	The day, month, and year in which an owner's herd is officially enrolled in the CWD certification program by an appropriate State official.
Herd	A group of animals that are (a) under common ownership or supervision and are grouped on one or more parts of any single premises (lot, farm, or ranch) or (b) all animals under common ownership or supervision on 2 or more premises which are geographically separated but on which animals have been interchanged or had direct or indirect contact with one another.
Herd inventory	An official list of all of the animals belonging to a herd including verification of the official or approved animal identifications.
Herd plan	A written herd management agreement developed by the herd owner, state and federal veterinarians, and others approved by the respective federal, state, and tribal officials. A herd plan sets out the steps to be taken to eradicate CWD from a CWD positive, exposed, or suspect herd.
Herd, CWD positive	A herd in which a CWD positive animal resided at the time it was diagnosed and which has not been released from quarantine.
Herd, suspect	A herd for which laboratory evidence or clinical signs suggest a diagnosis of CWD, but for which laboratory results have been inconclusive or not yet conducted.
Herd, exposed	A herd in which a CWD positive or exposed animal has resided 60 months prior to the diagnosis.
Herd, trace back	An exposed herd in which a CWD positive animal resided in any of the 60 months prior to the diagnosis.

Herd, trace forward	An exposed herd that has received exposed animals from a positive herd within 60 months of the diagnosis of CWD in the positive herd.
Hold order	A temporary order issued by a state or federal official prohibiting movement of animals from a premise.
ID, official	A form of identification approved by the USDA/APHIS administrator and the state chief animal health official.
Owner	An individual, partnership, company, corporation or other legal entity that has legal or rightful title to an animal or herd of animals.
Premises	The ground, area, buildings, water sources, and equipment commonly shared by a herd of animals.
Premises plan	The section of a herd plan which outlines actions to be taken with regard to possible environmental contamination due to a CWD positive or exposed herd.
Quarantine	An order issued by a state or federal official prohibiting movement of animals for a given period of time from a premises.
Status date	The day, month, and year on which the respective state official approves a change in the status of a herd in regard to CWD.
Test, official CWD	A CWD test approved by the USDA/APHIS administrator.

The following regulations of the National CWD Surveillance Program are more specifically addressed in other documentation (may be provided upon request):

(1) herd certification standards as regards fencing, surveillance, biological sampling, annual verified herd inventories, mandatory reporting of death, sold animals, and interstate movements of captive elk, official and unique animal identifiers, premise locations, herd status, positive diagnosis of CWD, and development and implementation of a herd plan;

(2) options for disposition of CWD positive, exposed, or suspect herds; and

(3) minimum requirements for interstate movement of captive elk.

Appendix E. Cervid Import Requirements for Minnesota (BAH)

(Includes all members of the family Cervidae, including deer, elk, moose, reindeer, caribou)
Revised March 2002

1. A permit must be obtained prior to the importation of any Cervidae.

2. All Cervidae imported into Minnesota must be accompanied by a Certificate of Veterinary Inspection (CVI) issued by an accredited veterinarian.

3. All Cervidae imported into Minnesota must be individually indentified using one or more of the following: USDA metal eartag, Electronic ID, ear or lip tattoo with 4 or more digits, or NAEBA tag

4. Tuberculosis test requirement:

a. Movement from **accredited** herds

- No further tuberculosis testing required for importation.
- The TB accredited herd number must be written on the CVI.

b. Movement from **qualified** or **monitored** herd

- Animal must have a negative TB test within 90 days of shipment unless the whole herd test (including the animal for movement) was conducted within 90 days of movement.
- The TB qualified or monitored herd number must be written on the CVI.

c. Movement from **unclassified** herds

- Animal must be negative on 2 TB tests conducted not less than 90 days apart. Test dates and results must be written on the CVI.
- Second test must be done within 90 days of movement.
- Animals must be isolated from all other members of the herd during the testing period.

d. Movement of cervids from Michigan

Special restrictions and testing requirements apply. Call the Board of Animal Health at 651-296-2942.

e. Movement of cervids from Canada

Call the USDA office at 651-290-3691 and the Board of Animal Health at 651-296-2942 for requirements.

f. Movement of cervids into Minnesota TB accredited, qualified, or monitored herds

Herd additions must be from same or higher status or herd will lose its status unless additional testing is done before and after import. Call the Board of Animal Health if you have questions about herd additions to TB accredited, qualified, or monitored herds.

5. Brucellosis test requirement

a. All cervids > 6 months of age must have a negative Brucellosis test within 30 days of movement into Minnesota, unless originating from a Brucellosis certified herd.

6. **Chronic Wasting Disease Requirement**

a. No cervid originating from an area considered to be endemic for Chronic Wasting Disease will be allowed entry into Minnesota. This area includes:

Wyoming: Albany, Carbon, Converse, Laramie, Platte, Niobrara, Goshen
Nebraska: Kimball, Sioux, Banner, Scotts Bluff, Cheyenne, Deuel, Keith, Perkins, Chase
Colorado: Boulder, Gilpin, Larimer, Weld, Logan, Morgan, Phillips, Sedgwick, Washington
South Dakota: Fall River
Wisconsin: Dane, Iowa, Sauk, Columbia, Juneau, Jefferson, Rock, Green, Lafayette

b. No cervid can be imported that is from a herd that is infected or exposed to Chronic Wasting Disease, or that has purchased a cervid from an infected herd unless the herd has been cleared to the satisfaction of the Board.

c. All **elk** imported must be from a herd that has been participating in a state recognized CWD surveillance program for at least one year. The CWD herd number and numbers of years in the program must be written on the CVI.