An Agricultural Law Research Article

Chronic Wasting Disease of Deer and Elk: A Call for National Management

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Originally published in ENVIRONMENTAL LAW
33 ENVTL. L. 1059 (2003)

CHRONIC WASTING DISEASE OF DEER AND ELK: A CALL FOR NATIONAL MANAGEMENT

BY
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Chronic wasting disease (CWD) is an infectious, fatal, neurological disease affecting at least three species within the deer family—white-tailed deer, mule deer, and Rocky Mountain elk. The disease is of increasing concern to state and federal wildlife management agencies, as illustrated by temporary or emergency wildlife regulations directed at the management of CWD being implemented in at least 34 states since April 2002. While at least thirty states are developing or have developed new or additional CWD regulations, historically, wildlife managers have been ill-equipped to identify the presence of CWD or to manage outbreaks once identified. Because few CWD monitoring programs were in place before the 1990s, many alternative livestock operations have imported deer and elk from infected herds within the CWD endemic areas of northeastern Colorado, southeastern Wyoming, and western Nebraska, or from infected herds in non-endemic areas. Deer and elk from known CWD-infected alternative livestock operations were sold and transported to at least 19 states during the 1980s and 1990s. As a result, the disease has spread from the endemic areas to at least 69 captive deer and elk herds in at least 9 states, 2 Canadian provinces, and South Korea. It is also believed that alternative livestock operations may be one mechanism for the spread of CWD into free-ranging cervid populations in non-endemic areas. Chronic wasting disease can now be found in free-ranging deer or elk in at least eight states. The implications of CWD to state and federal wildlife managers are manifold. Both consumptive and non-consumptive users of deer and elk contribute more than $25 billion annually to agency budgets and local economies through direct and indirect spending. Tens of millions of dollars are spent annually in CWD cleanup and research—the total costs associated with the disease are incalculable. In addition, current treatment of CWD-infected herds is

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limited to depopulation of the entire herd and a reduction in surrounding cervid population densities in an attempt to eliminate the disease or at least to halt further infection. To protect valuable wildlife resources, eliminate further spread of CWD into non-endemic areas, and reduce CWD prevalence in the endemic area, this Comment calls for a federal alternative livestock operation certification program and for state and federal wildlife agencies to adopt aggressive chronic wasting disease management plans.

I. INTRODUCTION

Chronic wasting disease (CWD) is an infectious, naturally occurring, always fatal, progressively degenerative, neurological disease affecting at least three members of the deer family (*Cervidae* or Cervid)[1] that is

[1] Chronic wasting disease is known to affect mule deer (*Odocoileus heminous*), white-tailed deer (*O. virginianus*), and Rocky Mountain elk (*Cervus elaphus nelsoni*). Murray R. Woodbury, *Chronic Wasting Disease—The North American Situation*, 18 DEER BRANCH COURSE 47 (2001). Although several sources have reported diseases in humans linked to CWD, there have been no confirmed cases of CWD in humans and the possibility of transmission to humans is thought to be remote. *See, e.g.*, CARLA BENNETT, STOP THE MADNESS THAT CAUSED MAD DEER DISEASE, *at* http://www.peta.org/liv/c/72.html (speculating that a causal link may exist between CWD and Creutzfeldt–Jakob Disease, the prion disease known to affect humans) (last visited

spreading in several states.[2] As a result, state and federal governments and private organizations are scrambling to develop management plans and implement legislation and regulations to control the disease.[3] Without a forceful regulatory response, CWD will likely lead to significant declines in cervid populations, increases in state and federal management expenditures, and significant negative economic impacts to rural communities that depend on wildlife-related recreation.[4]

Although CWD is endemic to northeastern Colorado, southeastern Wyoming, and northwestern Nebraska, recently the disease has spread well beyond the endemic area.[5] Chronic wasting disease has been identified in at least 12 states and 2 Canadian provinces—Colorado, Illinois, Kansas, Minnesota, Montana, Nebraska, New Mexico, Oklahoma, South Dakota, Wisconsin, Wyoming, and most recently Utah in the United States; Alberta and Saskatchewan in Canada.[6]

Nov. 16, 2003); Ermias D. Belay et al., *Creutzfeldt-Jakob Disease in Unusually Young Patients Who Consumed Venison*, 58 ARCHIVES OF NEUROLOGY 1673 (2001) (finding no causal link between three patients who consumed venison and later contracted Creutzfeldt-Jakob Disease); G. J. Raymond et al., *Evidence of a Molecular Barrier Limiting Susceptibility of Humans, Cattle and Sheep to Chronic Wasting Disease*, 19 EMBO J. 4425 (2000) (noting that experimental results "demonstrate a barrier at the molecular level that should limit the susceptibility of [humans and non-cervid species] to CWD").

[2] John E. Gross & Michael W. Miller, *Chronic Wasting Disease in Mule Deer: Disease Dynamics and Control*, 65 J. WILDLIFE MGMT. 205, 205–06, 213–14 (2001); Elizabeth S. Williams et al., *Chronic Wasting Disease of Deer and Elk: A Review with Recommendations for Management*, 66 J. WILDLIFE MGMT. 551, 551–53 (2002).

[3] Thomas M. Franklin et al., *CWD Crisis Expands*, 30 WILDLIFE SOC'Y BULL. 951 (2002); *see* MICHIGAN DEP'T OF NATURAL RESOURCES, CHRONIC WASTING DISEASE AND CERVIDAE REGULATIONS BY STATE, IN THE UNITED STATES (July 9, 2003) (on file with author) (comparing state CWD regulations); *see, e.g.*, N.C. ADMIN. CODE tit. 15A, r. 10B.0101(b) (2003) (emergency rule banning all cervid importation into North Carolina "until the U.S. Department of Agriculture (USDA) establishes a [CWD] program that includes a test to detect Chronic Wasting Disease, along with requirements for monitoring cervids that shall establish a basis for determining whether a cervid and any cervid herd or farm on which the tested animal has resided has been free of CWD for five years").

[4] Franklin et al., *supra* note 3, at 951 ("Unchecked, CWD could result in declines in elk and deer populations, increased government expenditures to contain the disease, and increased economic impact on wildlife agencies and rural communities.").

[5] Elizabeth S. Williams et al., *Chronic Wasting Disease: Implications and Challenges for Wildlife Managers*, 67 TRANSACTIONS N. AM. WILDLIFE & NAT. RESOURCES CONF. 87, 94 (2002).

[6] Williams et al., *supra* note 2, at 552–53; Press Release, Minnesota Board of Animal Health, Chronic Wasting Disease Found in a Farmed Elk from Aitkin County, MN (Aug. 30, 2002) (on file with author) [hereinafter Minnesota Board of Animal Health] (announcing the confirmation of the first case of CWD in Minnesota); Press Release, Illinois Department of Natural Resources, Positive CWD Case Found in Illinois (Nov. 1, 2002) [hereinafter Illinois Department of Natural Resources] (reporting the initial case of CWD in Illinois, occurring in a free-ranging white-tailed deer near the identified disease foci of southern Wisconsin), *available at* http://dnr.state.il.us/pubaffairs/2002/Nov/CWDpositiveNov2002.htm; UTAH DIV. OF WILDLIFE RESOURCES, DEER FROM NORTHEASTERN UTAH TESTS POSITIVE FOR CHRONIC WASTING DISEASE (2003) (reporting the initial case of CWD in Utah found in a free-ranging mule deer confirmed on Feb. 18, 2003), *at* http://www.wildlife.utah.gov/news/03-02/cwd_found.html; Damien O. Joly et al., *Chronic Wasting Disease in Free-Ranging White-Tailed Deer*, 9 EMERGING INFECTIOUS DISEASES 599 (2003).

The recent spread of the disease into non-endemic areas is probably associated with the sale and transport of domestic deer and elk from contaminated alternative livestock facilities—also known as game ranches or farms.[7] Alternative livestock operations represent a significant business in North America; for example, in 1996, there were approximately 60,000 deer farmed in North America on more than 100 venison-producing livestock operations.[8] In addition to deer, elk are farmed extensively throughout North America; there are an estimated 160,000 elk in captivity on 2,300 U.S. and Canadian elk ranches.[9] Since 1997, CWD has been detected in at least 24 privately owned elk herds in 8 states.[10] Private game ranches are thought to be the source of many of the outbreaks in free-ranging cervid populations in non-endemic areas—known as "spillover" infections.[11] These spillover events likely occur either via 1) captive animals escaping and infecting the wild population, 2) free-ranging animals entering the enclosure and then being released after infection, or 3) some level of contact through the enclosure fencing which leads to infection.

Unlike most infectious diseases, CWD does not appear to have an equilibrium point at which the disease ceases to increase in prevalence and

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[7] Williams et al., *supra* note 2, at 552–53; *see, e.g.*, Theo Stein, *USDA May Buy up to 245 Elk: Animals from Colorado Ranch Where Brain Malady Found Now in 15 States*, DENVER POST, Oct. 12, 2001, at B4 (245 domestic elk in 15 states traced to a single CWD-affected elk ranch, Elk Echo Ranch, Colorado), *available at* 2001 WL 27668443. For an overview of game ranching in the United States, see Terence P. Yorks, *Ranching Native and Exotic Ungulates in the United States*, *in* WILDLIFE PRODUCTION SYSTEMS 268–85 (Robert J. Hudson et al. eds., 1989). See also Section III.A, *infra*, for a brief discussion of alternative livestock operations.

[8] Ronald J. White, *Big Game Ranching*, *in* ECOLOGY AND MANAGEMENT OF LARGE MAMMALS IN NORTH AMERICA 260, 265 (Stephen Demarais & Paul R. Krausman eds., 2000) [hereinafter LARGE MAMMAL ECOLOGY]. *See* Lyle A. Renecker et al., *Game Production in Western Canada*, *in* WILDLIFE PRODUCTION SYSTEMS, *supra* note 7, at 248 ("Development of commercial bison and wapiti [elk] operations was motivated largely by attractive returns for breeding stock (US$ 2500), meat (US$ 8/kg [$3.62 per pound]), and velvet antlers (US$ 100/kg [$45.35 per pound]).").

[9] Antonio Regalado, *Medical Mystery: Growing Plague of "Mad Deer" Baffles Scientists*, WALL ST. J., May 24, 2002, at A1, *available at* 2002 WL-WSJ 3395866.

[10] Lynn H. Creekmore, *Distribution and Status of Chronic Wasting Disease in Farmed Cervids in the USA*, *in* CHRONIC WASTING DISEASE SYMPOSIUM 10 (2002) (CWD has been detected in Colorado, Kansas, Montana, Nebraska, Oklahoma, and South Dakota), *available at* http://wildlife.state.co.us/CWD/Symposium_booklet.pdf; Minnesota Board of Animal Health, *supra* note 6 (CWD detected in Minnesota); Dennis Chaptman, *Diseased Elk Found in Manitowoc County*, MILWAUKEE J. SENTINEL, Mar. 26, 2003, at 1B (initial detection of CWD in a farm-raised elk in Wisconsin), *available at* 2003 WL 3313507.

[11] Gross & Miller, *supra* note 2, at 205; Williams et al., *supra* note 2, at 552–53. "Concern about potential dissemination of CWD via movement of farmed elk in commerce was expressed well before it was identified in the industry." Williams et al., *supra* note 2, at 552 (internal citation omitted). Domestic elk may have served as sources of infection in free-ranging deer in Colorado, Nebraska, and South Dakota. *Id.* The sources of CWD infections in free-ranging deer in Wisconsin, New Mexico, and Utah remain unknown and are under investigation. *Id.* at 552–53. In addition to CWD, captive cervids present a potential vector for more traditional diseases, such as brucellosis or tuberculosis, which could be transmitted from the captive herd to free-ranging wildlife or other livestock. Michael W. Miller & E. Tom Thorne, *Captive Cervids as Potential Sources of Disease for North America's Wild Cervid Populations: Avenues, Implications and Preventive Management*, 58 TRANSACTIONS N. AM. WILDLIFE & NAT. RESOURCES CONF. 460 (1993).

coexist with uninfected populations.[12] The disease appears to either result in continuously increasing disease prevalence within the local cervid population or, if population densities are sufficiently low, an eventual loss of CWD from the population.[13] Population modeling only showed a loss of CWD from the simulated population when an extensive, selective cull (*i.e.*, removal and destruction of target animals in specific locations) occurred, thereby reducing the transmission rate or resulting in the death of the infected animals before transmission could occur.[14]

The implications of these models are troubling. If left unchecked, CWD will result in the loss of significant free-ranging deer and elk herds. As these heavily infected populations die out, newly infected populations—either at the edge of the heavily infected population or infected through human-induced disease introduction (*i.e.*, animal translocation)—will continue to provide a source of infection, leading to the persistence and spread of the disease.[15]

The potential impacts to local economies are staggering. Both consumptive and nonconsumptive users of deer and elk contribute more than $20 billion annually to agency budgets and local economies through direct and indirect spending.[16] Additionally, tens of millions of dollars are spent annually in CWD cleanup and research.[17]

Thus far, state laws have had little effect in stopping shipments of animals from contaminated facilities, largely because the disease has a prolonged incubation period[18] and state monitoring programs for the disease

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[12] Gross & Miller, *supra* note 2, at 213. In modeling CWD prevalence in Colorado and Wyoming, scientists manipulated the following factors: 1) survival, 2) recruitment rate, 3) fawn sex ratio, 4) disease incubation and infectious periods, 5) the number of infectious contacts, and 6) the probability of transmission to other animals. *Id.* at 207. The resulting models allow researchers to better understand the interactions between the multiple factors that contribute to disease transmission between infected and uninfected populations. *See* James A. Bailey, *The Data Bases of Wildlife Management*, *in* PRINCIPLES OF WILDLIFE MANAGEMENT 306, 328–29 (1984) (explaining the use of simulation modeling in wildlife management).

[13] Gross & Miller, *supra* note 2, at 213 ("All parameter sets simulated eventually resulted in extinction of the deer population or eventual loss of CWD from the deer population.").

[14] *Id.* Selective culls are being implemented in several states, including Colorado and Wisconsin. Memorandum from Darrell Bazzell, Secretary of Wisconsin Department of Natural Resources, to Natural Resources Board Members, (June 3, 2002) [hereinafter Bazzell Memo], *available at* http://www.dnr.state.wi.us/org/land/wildlife/Whealth/issues/Cwd/emerrule.pdf; Williams et al., *supra* note 2, at 559.

[15] Gross & Miller, *supra* note 2, at 213.

[16] Brian P. Murphy, *Concerns of Whitetail Hunters and Managers Regarding CWD*, *in* CHRONIC WASTING DISEASE SYMPOSIUM, *supra* note 10, at 24.

[17] *Oversight Hearing on* Chronic Wasting Disease *Before the Subcomms. on Forests and Forest Health & Fisheries Conservation, Wildlife, and Oceans, Comm. on Resources*, 107th Cong. (2002) (statement of Dr. Jim Butler, Deputy Under Secretary, Marketing and Regulatory Programs, U.S. Department of Agriculture) [hereinafter Butler Testimony], *available at* http://resourcescommittee.house.gov/107cong/forests/2002may16/butler.htm.

[18] References to terms associated with traditional disease pathology such as infectious, infected, or incubation are commonly used in relation to animals showing abnormal prion protein in their tissues. Strictly speaking, this usage is incorrect because the prion is a nonliving substance that contains no nucleic acid, unlike traditional disease agents—bacteria, viruses, fungi, or microbiotic organisms. "The usage, however is appropriate because the disease

are relatively new to the industry.[19] In addition, there are no test methods available for testing live animals for CWD; the only definitive diagnostic involves sampling brain tissue postmortem.[20] As a result, captive deer and elk that may have been exposed to the CWD contagion prior to the state surveillance program are not barred from interstate commerce if the symptoms of CWD have not yet arisen in the source herd. If all interstate transportation of deer and elk were stopped today, the resulting disease spread still would not be completely known for at least five years.[21]

As a result of the dramatic spread of CWD, Congress has proposed several pieces of legislation[22] and state agencies are implementing emergency regulations and response plans.[23] Unfortunately, these efforts are

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behaves in a contagious manner, spreading from animal to animal in a manner analogous to that of a [traditional infectious] agent." MARKUS J. PETERSON ET AL., REVIEW OF CHRONIC WASTING DISEASE MANAGEMENT POLICIES AND PROGRAMS IN COLORADO 6 (2002), *available at* http://wildlife.state.co.us/CWD/BlueRibbonReport.pdf.

19 Williams et al., *supra* note 2; U.S. DEP'T OF AGRICULTURE ET AL., PLAN FOR ASSISTING STATES, FEDERAL AGENCIES, AND TRIBES IN MANAGING CHRONIC WASTING DISEASE IN WILD AND CAPTIVE CERVIDS (2002), *available at* http://www.aphis.usda.gov/lpa/issues/cwd/cwd62602.html.

20 Lisa L. Wolfe et al., *Evaluation of Antemortem Sampling to Estimate Chronic Wasting Disease Prevalence in Free-Ranging Mule Deer*, 66 J. WILDLIFE MGMT. 564 (2002). "[S]trategies for detecting and managing foci of CWD presently are hampered by the lack of reliable methods for diagnosing infection in live deer and elk." *Id.* An experimental test is being evaluated that would allow live-testing of white-tailed and mule deer for CWD. This test probably will not be a widespread means for determining disease prevalence in free-ranging deer populations, however, because of the expense and practical limitations of the method. *Id.* at 569–71.

21 Due to the uncertainty and variation associated with the disease, five years is believed to be a reasonable minimum estimate of the maximum incubation period of the disease and is a common limit of state regulated monitoring programs. Williams et al., *supra* note 2, at 556–57; MICHIGAN DEP'T OF NATURAL RESOURCES, *supra* note 3 (listing several requirements for state regulated captive cervid monitoring).

22 Chronic Wasting Disease Support Act of 2003, S. 1036, 108th Cong. (2003); Chronic Wasting Disease Support for States Act of 2003, H.R. 2057, 108th Cong. (2003); Chronic Wasting Disease Research, Monitoring, and Education Enhancement Act of 2003, H.R. 2430, 108th Cong. (2003); Chronic Wasting Disease Task Force Establishment Act of 2003, H.R. 2431, 108th Cong. (2003); Chronic Wasting Disease Financial Assistance Act of 2003, S. 1366, 108th Cong. (2003); Chronic Wasting Disease Financial Assistance Act of 2003, H.R. 2636, 108th Cong. (2003); Chronic Wasting Disease State Support Act of 2002, S. 2560, 107th Cong. (2002); Comprehensive Wildlife Disease Testing Acceleration Act of 2002, S. 3090, 107th Cong. (2002); Chronic Wasting Disease Research and Response Act of 2002, H.R. 4740, 107th Cong. (2002); Chronic Wasting Disease Support for States Act of 2002, H.R. 4795, 107th Cong. (2002); Comprehensive Wildlife Disease Testing Acceleration Act of 2002, H.R. 5608, 107th Cong. (2002). See Section IV.C, *infra*, for an analysis of these proposals.

23 MICHIGAN DEP'T OF NATURAL RESOURCES, *supra* note 3. *See, e.g.*, MICHIGAN DEP'T OF NATURAL RESOURCES & MICHIGAN DEP'T OF AGRICULTURE, MICHIGAN SURVEILLANCE AND RESPONSE PLAN FOR CHRONIC WASTING DISEASE OF FREE-RANGING AND PRIVATELY-OWNED/CAPTIVE CERVIDS (2002), *available at* http://www.michigan.gov/documents/CWD_ContingencyPlan_41755_7.pdf; SOUTH DAKOTA DEP'T OF GAME, FISH, & PARKS, CHRONIC WASTING DISEASE MANAGEMENT PLAN FOR FREE-RANGING DEER AND ELK IN SOUTH DAKOTA (2002), *available at* http://www.state.sd.us/gfp/divisionwildlife/hunting/BigGame/CWDmanagementplan.htm; TEXAS ANIMAL HEALTH COMM'N & TEXAS PARKS AND WILDLIFE DEP'T, TEXAS CHRONIC WASTING DISEASE MANAGEMENT PLAN REVISED (Apr. 24, 2003), *available at* http://www.tpwd.state.tx.us/hunt/chronic_wasting_disease/management_plan/.

primarily reactive and little consistency among state programs exists.[24] After a brief overview of the disease, this Comment examines regulations limiting the transportation of animals from alternative livestock facilities, assesses state and federal legislation, agency policies, and public concerns in dealing with the spread of CWD, and proposes aggressive, nationally uniform regulations designed to halt further spillover CWD outbreaks.

II. A PRIMER ON CHRONIC WASTING DISEASE

A. Prion Diseases: What Are They?

Chronic wasting disease is a member of a relatively rare group of diseases known as transmissible spongiform encephalopathies (TSEs) or prion diseases.[25] Other TSE diseases include scrapie in domestic goats and sheep;[26] transmissible mink encephalopathy in domestic mink;[27] Creutzfeldt–Jakob Disease (CJD)[28] and variant CJD (vCJD)[29] in humans; and bovine spongiform encephalopathy (BSE) in cattle, commonly referred to as mad cow disease.[30]

The specific causes of TSEs remain unknown; however, the accepted theory is that the disease follows the infection of abnormal prion proteins, which spontaneously replicate and accumulate in the brain, ultimately

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[24] U.S. DEP'T OF AGRICULTURE ET AL., *supra* note 19.

[25] Woodbury, *supra* note 1, at 47. For a review of prion diseases, see PRION DISEASES OF HUMANS AND ANIMALS (Stanley Prusiner et al. eds., 1992); INFECTIOUS DISEASE OF WILD MAMMALS (Elizabeth S. Williams & Ian K. Barker eds., 2001); Bart Van Everbroeck et al., *Transmissible Spongiform Encephalopathies: The Story of a Pathogenic Protein*, 23 PEPTIDES 1351 (2002).

[26] International Committee on Taxonomy of Viruses, *90.001. Prions*, UNIVERSAL VIRUS DATABASE ICTVDB, *at* http://life.bio2.edu/Ictv/fs_prion.htm (last modified Feb. 14, 2002) [hereinafter UNIVERSAL VIRUS DATABASE]. *See also* A.G. Dickinson, *Scrapie in Sheep and Goats*, *in* SLOW VIRUS DISEASES OF ANIMALS AND MAN 209–41 (R.H. Kimberlin ed., 1976) (providing a detailed discussion of scrapie in sheep and goats). While scrapie has been identified in domestic sheep for more than 200 years and "the infectious nature of sheep scrapie has been long recognized, the mode of transmission within a flock [remains un]clear." Bruce Chesebro, *Prion Protein and the Transmissible Spongiform Encephalopathy Diseases*, 24 NEURON 503 (1999).

[27] UNIVERSAL VIRUS DATABASE, *supra* note 26; *see also* B.E.C. Schreuder, *Animal Spongiform Encephalopathies—An Update Part 1. Scrapie and Lesser Known Animal Spongiform Encephalopathies*, 16 VETERINARY Q. 174, 179 (1994) (Transmissible mink encephalopathy has been reported in North America and Europe; it was demonstrated as transmissible in 1965.).

[28] UNIVERSAL VIRUS DATABASE, *supra* note 26; *see also* J. Tateishi et al., *Prion Protein Gene Analysis and Transmission Studies of Creutzfeldt–Jakob Disease*, *in* PRION DISEASES OF HUMANS AND ANIMALS, *supra* note 25, at 129–30 (describing genetic studies of CJD from French, German, and Japanese patients and their family members).

[29] *See generally* R. G. Will et al., *A New Variant of Creutzfeldt–Jakob Disease in the UK*, 347 LANCET 921 (1996) (initially recognizing vCJD as distinct from CJD and suggesting the link between vCJD and BSE).

[30] UNIVERSAL VIRUS DATABASE, *supra* note 26; *see generally* G.A.H. Wells et al., *A Novel Progressive Spongiform Encephalopathy in Cattle*, 121 VETERINARY RECORD 419 (1987) (recognizing BSE in cattle as a spongiform encephalopathy); D.M. Taylor, *Bovine Spongiform Encephalopathy—The Beginning of the End?*, 153 BRITISH VETERINARY J. 501 (1996) (providing a review of BSE from initial detection in cattle and likely transmission vectors through subsequent diagnosis and control measures).

causing neurologic symptoms.[31] Prion proteins are normally found in nervous and lymphoid tissues of all mammals; however, in TSEs, an abnormal prion develops in an altered configuration—the abnormal prion is folded into a structure that is physically different from the normal prion.[32] The resulting configuration is resistant to the normal degradation processes of the body and is apparently capable of self-replication.[33] This self-replication process continues in a chain reaction, resulting in a buildup of abnormal prions in the central nervous system.[34] Degenerative changes in the brain follow,[35] including characteristic lesions (*i.e.*, multitude small "holes" in the brain), resulting in a sponge-like appearance from which all "spongiform" diseases gain their names.[36]

While the TSEs behave like infectious diseases, that is they are capable of being transmitted between animals, TSE agents appear to have no genetic identity.[37] Therefore, the prion contagion is more correctly classified as a unique type of toxicity rather than a biologic infection.[38] In addition, the prion agent has a remarkable resistance to a wide range of environmental conditions and can withstand a range of treatments that would kill or

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31 Woodbury, *supra* note 1, at 47.

32 Stephen J. DeArmond & Essia Bouzamondo, *Fundamentals of Prion Biology and Diseases*, 181–82 TOXICOLOGY 9, 12–14 (2002); Van Everbroeck et al., *supra* note 25, at 1353–55. The physiologic role of normal prion protein remains unclear, but some possible functions include protection of the brain from oxidative stress, increased interconnection between nerve cells, and a role in the formation of memory. Vilma Regina Martins & Ricardo Renzo Brentani, *The Biology of Cellular Prion Protein*, 41 NEUROCHEMISTRY INT'L 353, 353–54 (2002); *see generally* Gabor G. Kovacs et al., *The Prion Protein in Human Neurodegenerative Disorders*, 329 NEUROSCIENCE LETTERS 269 (2002) (suggesting a relationship between prion proteins and other neurodegenerative diseases, such as Alzheimer's and Parkinson's diseases); Ruliang Li et al., *The Expression and Potential Function of Cellular Prion Protein in Human Lymphocytes*, 207 CELLULAR IMMUNOLOGY 49 (2001) (examining a possible role of normal prion protein in the immune system).

33 Van Everbroeck et al., *supra* note 25, at 1353–54; Elizabeth S. Williams et al., *Transmissible Spongiform Encephalopathies*, *in* INFECTIOUS DISEASES OF WILD MAMMALS, *supra* note 25, at 292. Although greatly simplified, the process of self-replication of abnormal prions can be analogized to the formation of crystals in a saturated sugar solution. Without a seed to build upon, no crystals will form in the sugar solution. Once a seed is added, small crystals quickly form and build upon each other until a larger crystal results. In TSEs, nervous tissues can be thought of as a normal prion–saturated solution, and the abnormal prion as a "seed." In the absence of the "seed," the normal prion maintains its state, but with the addition of the abnormal prion "seed," the normal tissue quickly transforms into what is known as a TSE disease.

34 Van Everbroeck et al., *supra* note 25, at 1353–54.

35 John Collinge & Mark S. Palmer, *Molecular Genetics of Inherited, Sporadic and Iatrogenic Prion Disease*, *in* PRION DISEASES OF HUMANS AND ANIMALS, *supra* note 25, at 113–14.

36 Woodbury, *supra* note 1, at 47–48; *see generally* E.S. Williams & S. Young, *Neuropathology of Chronic Wasting Disease of Mule Deer (*Odocoileus hemionus*) and Elk (*Cervus elaphus nelsoni*)*, 30 VETERINARY PATHOLOGY 36 (1993).

37 Van Everbroeck et al., *supra* note 25, at 1352; Williams et al., *supra* note 33, at 292. Conventional disease agents, such as bacteria, viruses, fungi, or microbiotic organisms, all contain nucleic acids—DNA or RNA.

38 Williams et al., *supra* note 33, at 292.

inactivate conventional infectious agents.[39] This makes the treatment and control of TSE outbreaks more difficult.[40]

Although the intensity of symptoms varies between individual cases, a discernable group of symptoms normally present in all TSEs. As the abnormal prion accumulates in the brain and the spongiform process progresses, the infected individual gradually undergoes behavioral changes, including dementia, ataxia (loss of motor control), and mild to severe tremors.[41] As the disease progresses, the affected animal undergoes a loss of body condition and may decrease interaction with the animal handler or other members of the herd.[42] There is no treatment for animals affected by TSEs and the degeneration continues, ultimately resulting in death.[43]

B. History and Distribution of Chronic Wasting Disease

A "chronic wasting disease" was first identified in mule deer held at a research facility in northern Colorado in the late 1960s.[44] In 1978, chronic wasting disease was categorized as a TSE through histopathology.[45] Following these initial diagnoses in captive mule deer, CWD was identified in captive elk,[46] free-ranging elk,[47] free-ranging mule deer,[48] and free-ranging white-tailed deer.[49] Although CWD was not detected in free-ranging deer populations until the mid- to late-1980s, disease modeling suggests that CWD

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[39] *Id.*; D.M. Taylor, *Inactivation of Transmissible Degenerative Encephalopathy Agents: A Review*, 159 VETERINARY J. 10, 11–15 (2000) (describing how, unlike microbial agents, prions are resistant to traditional sterilization methods, including autoclaving, disinfectants, and radiation, and they remain intact in the environment for years); Bette Hileman, *The 'Mad' Disease Has Many Forms*, 79 CHEMICAL & ENGINEERING NEWS 24, 25 (2001) (stating that a prion is "totally degraded only with incineration at temperatures greater than 1000 °F or treatment with strong sodium hydroxide solutions"); Dickinson, *supra* note 26, at 218 (describing scrapie-agent resistance to traditional sterilization methods). See notes 95–102 and accompanying text, *infra*, for examples of the environmental persistence of TSEs.

[40] *See, e.g.*, Michael W. Miller et al., *Epidemiology of Chronic Wasting Disease in Captive Rocky Mountain Elk*, 34 J. WILDLIFE DISEASES 532, 532–37 (1998) (discussing the ultimately unsuccessful procedures utilized in an attempt to eliminate the CWD contagion from contaminated research pens).

[41] Gareth W. Roberts & Joanne Clinton, *Prion Disease: The Spectrum of Pathology and Diagnostic Considerations*, *in* PRION DISEASES IN HUMANS AND ANIMALS, *supra* note 25, at 225.

[42] Williams et al., *supra* note 33, at 294.

[43] *Id.*

[44] E.S. Williams & S. Young, *Chronic Wasting Disease of Captive Mule Deer: A Spongiform Encephalopathy*, 16 J. WILDLIFE DISEASES 89 (1980).

[45] *Id.* Histopathology is the study of disease and its characteristic tissue changes. J.E. SCHMIDT, 3 ATTORNEY'S DICTIONARY OF MEDICINE H-156 (2002).

[46] Elizabeth S. Williams & Stuart Young, *Spongiform Encephalopathy of Rocky Mountain Elk*, 18 J. WILDLIFE DISEASES 465 (1982) (CWD identified in captive mule deer and elk herds in Wyoming in the early 1980s).

[47] T.R. Spraker et al., *Spongiform Encephalopathy in Free-Ranging Mule Deer (*Odocoileus hemionus*), White-Tailed Deer (*Odocoileus virginianus*), and Rocky Mountain Elk (*Cervus elaphus nelsoni*) in Northcentral Colorado*, 33 J. WILDLIFE DISEASES 1 (1997) (identifying CWD in free-ranging Colorado and Wyoming elk in 1981).

[48] Williams et al., *supra* note 33, at 293 (identifying CWD in free-ranging Colorado mule deer in 1985).

[49] *Id.* (identifying CWD in free-ranging white-tailed deer in Colorado and Wyoming in 1990).

may have been present in some free-ranging deer populations for twenty years or more before it was first detected.[50]

Chronic wasting disease is considered endemic to a relatively small area in northeastern Colorado, southeastern Wyoming, and western Nebraska. The endemic area is a roughly 40,000 square-kilometer (15,444 square-mile) area bordered by the North and South Platte Rivers and is home to approximately 62,000 deer, mostly mule deer, and 13,200 elk, distributed among several resident subpopulations.[51] Although it is believed that CWD originated somewhere within the endemic area, the disease has been identified in captive and free-ranging deer and elk herds in at least 12 states, 2 Canadian provinces, and South Korea.[52] Chronic wasting disease has been found in at least 61 captive elk herds in Colorado, Kansas, Minnesota, Montana, Nebraska, Oklahoma, South Dakota, Wisconsin, Alberta, Saskatchewan, and South Korea.[53] Additionally, CWD has been identified in free-ranging deer in Saskatchewan, Illinois, Nebraska, New Mexico, Minnesota, South Dakota, Utah, Wisconsin, and in non-endemic areas of central and western Colorado.[54]

In addition to the endemic area, scientists have identified geographically distinct foci of infection in western Saskatchewan, northwestern Nebraska, and southwestern South Dakota that seem to represent spillover infection from private alternative livestock operations.[55] The origin of disease foci in south-central Wisconsin and northern Illinois, northwestern Colorado, and southern New Mexico remain unknown and are under investigation.[56]

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[50] Michael W. Miller et al., *Epizootiology of Chronic Wasting Disease in Free-Ranging Cervids in Colorado and Wyoming*, 36 J. WILDLIFE DISEASES 676, 688 (2000). Disease modeling permits scientists to better predict disease prevalence within and between individual populations. Once an adequate model is developed, the results of various proposed management activities can be tested *a priori*. Bailey, *supra* note 12, at 328–29.

[51] Miller et al., *supra* note 50, at 677.

[52] Williams et al., *supra* note 2, at 552–53; Illinois Department of Natural Resources, *supra* note 6; Minnesota Board of Animal Health, *supra* note 6. In South Korea, the affected seven-year-old, captive bull elk was imported from Canada in March 1997. After a three week history of body weight loss, emaciation, excessive salivation, and other CWD-related symptoms, the elk was euthanized and subsequently confirmed to be suffering from CWD. This was the first case of CWD being identified outside of the United States or Canada. As a result, South Korea has banned temporarily the importation of live cervids or cervid products from the United States and Canada. Hyun-Joo Sohn et al., *A Case of Chronic Wasting Disease in an Elk Imported to Korea from Canada*, 64 J. VETERINARY MED. SCI. 855 (2002). See notes 65–73 and accompanying text, *infra*, for a brief discussion of the symptoms of CWD.

[53] Williams et al., *supra* note 2, at 552–53; Illinois Department of Natural Resources, *supra* note 6; Minnesota Board of Animal Health, *supra* note 6; UTAH DIV. OF WILDLIFE RESOURCES, *supra* note 6; Damien O. Joly et al., *supra* note 6, at 599–600.

[54] Williams et al., *supra* note 2, at 552–53; Illinois Department of Natural Resources, *supra* note 6; Minnesota Board of Animal Health, *supra* note 6; UTAH DIV. OF WILDLIFE RESOURCES, *supra* note 6.

[55] Williams et al., *supra* note 2, at 553.

[56] *Id.* The detection of CWD in New Mexico is particularly troubling. Since the spring of 2002, 6 of 23 deer sampled from the White Sands Missile Range were CWD-positive, indicating the disease had probably been present for several years without detection. Additionally, there is no apparent route of transmission between the CWD endemic area and White Sands, a distance

An additional potential source of infection surrounds the successful reintroduction of elk into several eastern states. Arkansas,[57] Kentucky,[58] Michigan,[59] Pennsylvania,[60] Tennessee,[61] and Wisconsin[62] all now have resident, free-ranging, reintroduced elk populations. Although most reintroduced animals were obtained from non-endemic areas, the detection of CWD in numerous non-endemic areas without discernible transmission vectors is a significant concern. Many reintroduction efforts occurred in the 1980s and 1990s, prior to state monitoring of captive herds.[63] With only 10 to 15 years elapsing since the reintroductions, the possibility of CWD being introduced into the release areas is still a distinct possibility. In addition, many reintroduced herds are not of sufficient size to allow hunting and are strictly protected; therefore, surveillance data from hunter harvest, a critical

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of some 600 miles. Press Release, New Mexico Department of Game and Fish, Two More Deer Test Positive for Chronic Wasting Disease (Feb. 14, 2003), *available at* http://www.gmfsh.state.nm.us/PageMill_Images/Publication/2-14-03nr.pdf.

[57] MICHAEL E. CARTWRIGHT, ARKANSAS GAME & FISH COMM'N, A GUIDE TO ARKANSAS WILDLIFE: ELK IN THE NATURAL STATE, *at* http://www.agfc.state.ar.us/critters/wildlife_elk_p2.html (last visited Nov. 16, 2003). Rocky Mountain elk were initially reintroduced into Arkansas in the mid-1930s; however, this reintroduction effort ultimately failed. *Id.* Efforts were again made between 1981 and 1985, when 112 elk were translocated from Colorado and Nebraska. The population currently numbers approximately 400–450 elk occupying a 127,000 hectare (315,000 acre) range. *Id.*

[58] KENTUCKY DEP'T OF FISH & WILDLIFE, REINTRODUCTION OF ELK IN KENTUCKY, *at* http://www.kdfwr.state.ky.us/elkpage.htm (last visited Nov. 16, 2003). Elk were reintroduced into Kentucky during the winter of 1997–1998 and now number more than 1,500 ranging on a 192,000 hectare (475,000 acre) tract. *Id.*

[59] MICHIGAN DEP'T OF NATURAL RESOURCES, MICHIGAN ELK: PAST AND PRESENT, *at* http://www.michigan.gov/dnr/0,1607,7-153-10363_10856_10893-28275—,00.html (last visited Nov. 16, 2003). Elk were first reintroduced into Michigan in the early 20th century. The population peaked at more than 1,500 animals during the 1960s, but has since been managed at 800–900 animals. Hunting of this population has been allowed since 1984. *Id.*

[60] FERMATA, INC., PLAN FOR ELK WATCHING AND NATURE TOURISM IN NORTH CENTRAL PENNSYLVANIA 9, *available at* http://www.fermatainc.com/pennelk/pdf/pennelk_final.pdf. Rocky Mountain elk were initially translocated into Pennsylvania in 1913. The herd is expected to number nearly 1,500 by 2005 and occupies a 2,200 square-kilometer (835 square-mile) range in north-central Pennsylvania. *Id.*

[61] Press Release, Rocky Mountain Elk Foundation, Tennessee Elk Restoration Slated for December 19, News and Media (December 6, 2000), *available at* http://www.rmef.org/newsroom_media.html?main=/press_releases.php3&articleid=79. In 2000, 50 elk were reintroduced into a 271,000 hectare (670,000 acre) range on the Upper Cumberland Plateau of Tennessee; an additional 50–100 elk were expected to be released by 2004. *Id.*

[62] WISCONSIN DEP'T OF NATURAL RESOURCES, ELK HERD IN WISCONSIN—FREQUENTLY ASKED QUESTIONS, *at* http://www.dnr.state.wi.us/org/land/wildlife/Elk/questions.htm (last visited Nov. 16, 2003). In 1995, 25 elk were reintroduced into a 1,800 square-kilometer (700 square-mile) study area of Wisconsin. The herd has increased to approximately 100 individuals. *Id.*

[63] It is important to note that there are no testing techniques available that allow detection of CWD in an individual animal while it is alive; current detection methods involve monitoring discrete captive populations for a number of years and postmortem testing of brain tissue of animals that died while in captivity. Reintroduced elk were generally held in isolation for a short time (*e.g.*, 90 days) and screened for traditional diseases (*e.g.*, brucellosis). Therefore, there was no conclusive method available to detect CWD in animals captured from wild herds and subsequently utilized in reintroductions. *See, e.g., id.* (Elk were quarantined for 90 days and screened for common diseases that could be transmitted between elk and deer or livestock.).

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early detection method, is unavailable, potentially further masking the presence of the disease in eastern states.[64]

C. Diagnoses and Treatment

Chronic wasting disease–affected animals show few or no preclinical symptoms and early symptoms are likely to be so subtle that they would be overlooked easily by facility operators.[65] However, several clinical signs present in late-stage CWD; most strikingly, CWD-affected deer and elk show a loss of body condition and changes in behavior.[66] Clinical signs of CWD include excessive salivation, a loss of fear of humans, drooping of the head and ears, ataxia, and repetitive movements.[67] Chronic wasting disease–affected animals continue to eat, but likely consume reduced quantities of feed, resulting in a gradual loss of body condition.[68] Typically, infected animals succumb to the disease within several weeks to several months after clinical symptoms present;[69] however, the disease may be more subtle and prolonged in elk than in deer.[70] Common causes of death in infected animals are aspiration pneumonia—presumably due to a difficulty in swallowing, excessive salivation, and inhalation of foreign material into the lungs[71]—and traumatic injury (*e.g.*, broken bones or vehicle collisions) due to the behavioral changes associated with the terminal stages of the disease.[72] There is no treatment for CWD and the disease is inevitably fatal in all cases.[73]

Successful management of CWD depends on the early detection and elimination of CWD-affected cervids from disease foci.[74] Unfortunately, there are currently no reliable antemortem (*i.e.*, nonlethal) CWD tests available for elk and no practical tests available for deer.[75] As a result, CWD only can be diagnosed definitively through postmortem analyses.[76] Researchers currently are developing and evaluating diagnostic tools that may provide accurate, reliable, nonlethal testing methods; however, to date, the only successful antemortem test is able to detect the disease in deer only

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64 See Section IV.B, *infra*, for a discussion of CWD detection methods.

65 Jeanine Peters et al., *Immunohistochemical Diagnosis of Chronic Wasting Disease in Preclinically Affected Elk from a Captive Herd*, 12 J. VETERINARY DIAGNOSTIC INVESTIGATIONS 579 (2000); Williams et al., *supra* note 2, at 555.

66 Williams et al., *supra* note 33, at 294.

67 Woodbury, *supra* note 1, at 47–48.

68 Williams et al., *supra* note 2, at 555.

69 Williams & Young, *supra* note 36, at 36.

70 Williams et al., *supra* note 33, at 294.

71 Williams et al., *supra* note 2, at 556.

72 Woodbury, *supra* note 1, at 47–48.

73 Williams et al., *supra* note 33, at 295.

74 Wolfe et al., *supra* note 20, at 570.

75 *Id.* at 564.

76 *See* Peters et al., *supra* note 65, at 579 ("Traditional surveillance methods for CWD have relied primarily on identification of clinically affected animals or histopathologic examination of brain from slaughtered and dead animals."); *see also* Wolfe et al., *supra* note 20, at 569–71 (describing an experimental antemortem testing method that would allow identification of CWD in live deer).

and requires anesthesia, specialized equipment, and a specific technique to assure that viable samples are collected.[77] In addition, current antemortem testing requires specialized laboratory analysis by highly trained personnel, further limiting its practical application as a management tool.[78]

D. Implications for Wildlife Managers

The most significant implications of CWD are its economic effects. In 2001, 82 million people 16 years of age or older—39% of U.S. residents—participated in some form of wildlife-related recreation, spending $108 billion in the process.[79] Nationwide, big game hunting generated more than $10 billion;[80] wildlife watching generated approximately an additional $15 billion.[81] In Wyoming, deer and elk hunting supported 4,800 jobs and generated $182.7 million in 2001; when nonconsumptive wildlife-related recreation (*e.g.*, wildlife watching or photography) is factored in, 27,000 jobs were supported and $1.5 billion were generated in 2001.[82] Similarly, in Colorado, consumptive deer and elk use generates $1.7 billion per year, nonconsumptive wildlife-related recreation generates an addition $1.3 billion per year, and alternative livestock facilities generate approximately $44 million per year.[83] These levels of income are not restricted to western states. For example, Wisconsin estimates deer hunting alone has a $1.5 billion per year impact on local and state economies and state sales and

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[77] Lisa L. Wolfe, *Detecting Chronic Wasting Disease Infections in Live Animals*, *in* CHRONIC WASTING DISEASE SYMPOSIUM, *supra* note 10, at 11.

[78] *Id.*

[79] U.S. FISH & WILDLIFE SERVICE, 2001 NATIONAL SURVEY OF FISHING, HUNTING, AND WILDLIFE-ASSOCIATED RECREATION 4 (2001), *available at* http://www.census.gov/prod/2002pubs/FHW01.pdf. Approximately 11 million people participated in big game hunting, more than 34 million people observed mammals in residential settings, and more than 12 million took trips to feed, photograph, or observe large mammals. *Id.* at 22, 39, 45. For example, the bugling of bull elk during the fall is a popular event in many states and generates significant revenues. *See, e.g.*, WILDLIFE EXPEDITIONS, ELK BUGLING, WOLVES AND BEARS FALL EXPEDITION, *at* http://www.wildlifeexpeditions.org/info.php#6 (last visited Nov. 16, 2003) (offering a two-day elk and bear watching trip in Yellowstone National Park for $495 per person).

[80] U.S. FISH & WILDLIFE SERVICE, *supra* note 79, at 24; *see also* BUREAU OF LAND MANAGEMENT, *Estimated Amount of Hunting and Related Expenditures on Bureau of Land Management-Managed Lands, Fiscal Year 2001*, *in* PUBLIC LAND STATISTICS, 2001, 195–96 (2001) (Hunting was estimated to generate more than $763 million on Bureau of Land Management-managed lands alone in 2001.), *available at* http://www.blm.gov/natacq/pls01/pls4-5_01.pdf.

[81] Estimated expenditures by wildlife watchers was obtained by multiplying the percentage of wildlife watchers who observed, fed, or photographed mammals, either residentially or nonresidentially, by the total money spent on those activities (*i.e.*, 38.9% x $38.4 billion). U.S. FISH & WILDLIFE SERVICE, *supra* note 79, at 87–89.

[82] *Oversight Hearing on* Chronic Wasting Disease *Before the Subcomms. on Forests and Forest Health & Fisheries Conservation, Wildlife, and Oceans, Comm. on Res.*, 107th Cong. (2002) (statement of E. Tom Thorne, D.V.M., Chief of Services, Wyoming Game and Fish Department), *available at* http://resourcescommittee.house.gov/107cong/forests/2002may16/thorne.htm.

[83] Penelope Purdy, *Values Awry on CWD Control*, DENVER POST, Apr. 2, 2002, at B7, *available at* 2002 WL 6564175.

income tax revenues.[84] In addition, researchers estimate that each individual white-tailed deer harvested generates $1,250—with more than two million white-tailed deer harvested annually.[85] It is unquestionable that the impacts to local economies resulting from a reduction in wildlife-related recreation because of CWD will be substantial.[86]

In addition to the direct and indirect money derived from wildlife uses, the control of CWD places a great burden on state and federal management agencies. For example, the United States Department of Agriculture's Animal and Plant Health Inspection Service received nearly $15 million between September 2001 and May 2002 that has been used for indemnity payments and testing, disposal, and surveillance costs.[87] Additionally, several states have requested increased state and federal funding to assist state-administered CWD programs. For example, Colorado estimated an additional $3 million requirement for 2002,[88] Wisconsin requested an additional $4 million in emergency state funding for 2002 and $3 million in federal funding per year through 2006,[89] and Wyoming estimated a need for approximately $2 million per year in new money to participate fully in state, regional, and national CWD management and research.[90] Funding requirements are likely to be similar in other states with CWD outbreaks.

One of the primary difficulties in the management of CWD arises from the nature of the pathogen itself. Prions are incredibly resistant to traditional sterilization methods, usually remain viable after exposure to high heat,

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[84] Bazzell Memo, *supra* note 14.

[85] Scott R. Craven & Scott E. Hygnstrom, *Deer, in* PREVENTION AND CONTROL OF WILDLIFE DAMAGE D-26 (Scott E. Hygnstrom et al. eds., 1994).

[86] For example, following the detection of BSE in Canada in May, 2003, the U.S. Department of Agriculture temporarily halted all importation of hunter harvested deer and elk from Canada. Letter from Bobby Acord, Administrator, Animal & Plant Inspection Service, U.S. Department of Agriculture (Aug. 15, 2003), *available at* http://www.aphis.usda.gov/lpa/issues/bse/bsecan_hunternote8-15.pdf. This temporary ban resulted in cancellations of Canadian hunting trips by U.S. hunters, causing severe economic impact to local Canadian outfitters. *See, e.g.*, Graeme Smith, *Border Ban Triggers Drop in U.S. Hunters: Outfitters Report Widespread Cancellations.* GLOBE & MAIL, July 16, 2003, at A7 (reporting 9 cancellations of $2,500 bear-hunting reservations to one outfitter alone), *available at* West, Westlaw, 07/16/2003 GLOBEMAIL A7. The ban was subsequently lifted and strict importation guidelines were issued. Press Release, U.S. Department of Agriculture, Veneman Announces that Import Permit Applications for Certain Ruminant Products from Canada will be Accepted (Aug. 8, 2003), *available at* http://www.usda.gov/news/releases/2003/08/0281.htm; U.S. DEP'T OF AGRICULTURE, HUNTER-HARVESTED WILD RUMINANT MEAT FROM CANADA (Oct. 10, 2003) (outlining importation restrictions for hunter harvested animals, including deer and elk), *available at* http://www.aphis.usda.gov/lpa/issues/bse/trophies-from-can.pdf.

[87] Butler Testimony, *supra* note 17.

[88] JEFF VER STEEG, COLORADO DIV. OF WILDLIFE, CHRONIC WASTING DISEASE UPDATE (Oct. 15, 2002) (on file with author).

[89] *Oversight Hearing on* Chronic Wasting Disease *Before the Subcomms. on Forests and Forest Health & Fisheries Conservation, Wildlife, and Oceans, Comm. on Res.*, 107th Cong. (2002) (statement of Wisconsin Governor Scott McCallum), *available at* http://resourcescommittee.house.gov/107cong/forests/2002may16/mccallum.htm.

[90] Tom Thorne, *Policies and Strategies for Managing Chronic Wasting Disease in Wyoming, in* CHRONIC WASTING DISEASE SYMPOSIUM, *supra* note 10, at 19.

radiation, or disinfectants, and may remain in the environment for years.[91] The TSE agents are only degraded by incineration at temperatures greater than 1,000 °F (538 °C) or treatment with strong bleach solutions.[92] As a result, a newly developing concern centers on sanitization and disposal of wastewater at laboratory facilities. Because the prion agent is incredibly resistant to traditional wastewater treatment methods, the Environmental Protection Agency is concerned about the potential of the prion agent entering public wastewater systems and is scrutinizing laboratory practices at a Colorado Division of Wildlife research facility.[93] The ultimate result to affected areas could mean an increase in the cost of cleanup—especially if contaminated soils and facilities have to be removed and handled as toxic or hazardous waste under federal environmental statutes.[94]

The possibility of a recurring outbreak in areas in which repopulation of facilities after "cleanup" has occurred is also an important consideration. For example, CWD recurred in a captive population of elk in Colorado after extensive efforts at eradication.[95] In that case, after the captive herd was depopulated, soils in all paddocks were treated with a strong bleach solution, plowed to a depth of 0.3 meters (1 foot), and retreated with the strong bleach solution.[96] Additionally, all facilities, outbuildings, and feeding apparatuses were either treated twice with the strong bleach solution or replaced.[97] Finally, the entire facility was double-fenced with a 2.5-meter (8-foot) game-proof woven wire fence that provided at least a 6-meter (20-foot) barrier between captive and free-ranging cervids.[98] Despite these efforts, CWD recurred within three years of restocking the facility.[99]

A similar case involved scrapie, another disease in the TSE family affecting sheep and goats. In an effort to eradicate a number of diseases, including scrapie, sheep herds were destroyed within large areas of Iceland.[100] The areas were left free from sheep from one to three years, and then restocked from sheep herds from areas in which scrapie had never been recorded.[101] Over the next ten years, the disease reappeared in sheep herds on thirty of the farms included in the eradication areas.[102] These two

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91 Hileman, *supra* note 39, at 25; Taylor, *supra* note 39, at 11–15.

92 Hileman, *supra* note 39, at 25.

93 Todd Hartman, *EPA Eyes Wildlife's Lab Practices*, ROCKY MOUNTAIN NEWS, Sept. 6, 2002, at 6A, *available at* 2002 WL 9111918.

94 Prion agents could potentially be listed as hazardous or toxic waste under the Resource Conservation and Recovery Act of 1976, 42 U.S.C. §§ 6901–6992k (2000), or the Federal Water Pollution Control Act, 33 U.S.C. §§ 1251–1387 (2000), thereby exposing alternative livestock operators and state wildlife research facilities to federal liability for cleanup costs.

95 Miller et al., *supra* note 40, at 532–34.

96 *Id.* at 532.

97 *Id.*

98 *Id.*

99 *Id.* at 534. The facility was depopulated in 1985 and restocked in 1986. The first case of CWD recurring was confirmed in 1989, with additional cases confirmed in 1991, 1992, and 1995. Between 1986 and 1997, CWD was the only natural cause of adult mortality within the facility. *Id.*

100 Dickinson, *supra* note 26, at 235.

101 *Id.*

102 *Id.*

cases are illustrative of the long-term persistence of prion agents in the environment.

III. ALTERNATIVE LIVESTOCK OPERATIONS

A. Game Ranching and Farming in North America

Alternative livestock facilities—game ranches or farms—have long been operated in the United States and Canada.[103] The terms "game ranch" or "game farm" are used to denote several types of operations. In its simplest form, game ranching is the management of tracts of private land for the purpose of increasing the numbers of wild deer or elk that use that land. Access to the land is generally controlled by the landowner—the land may be fenced or unfenced—but the animals remain a *public* resource.[104] At its most intensive, game ranching involves the direct husbandry of a *privately owned* deer or elk herd.[105] The operator's land is fenced and access is strictly monitored. This form of game ranching is most analogous to more traditional animal producing operations, such as cattle ranching.[106] It is this level of active wildlife ranching that is of concern to wildlife managers working to curtail the spread of CWD.

Much like their domestic counterparts, game ranching entails the intentional raising of livestock animals. Game-ranched deer and elk serve the following three purposes: 1) they are harvested for meat or by-products (*e.g.*, velvet antler); 2) they are raised for commercial hunting, also called "canned hunting;" or 3) they are raised for live animal sales to various markets, including other game ranches.[107]

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[103] For an excellent synopsis of the social and biological impacts of wild ungulate ranching, see STEPHEN DEMARAIS ET AL., THE WILDLIFE SOC'Y, BIOLOGICAL AND SOCIAL ISSUES RELATED TO CONFINEMENT OF WILD UNGULATES, TECHNICAL REVIEW 02-3 (Laura Andrews ed., 2002). For a review of the economic aspect of private rights in wildlife and a history of how those rights developed, see Dean Lueck, *Property Rights and the Economic Logic of Wildlife Institutions*, 35 NAT. RESOURCES J. 625 (1995).

[104] Although, in this instance, the state maintains title in trust for the benefit of its citizens, the landowner of the land on which the wildlife is found has a qualified property interest. Without the landowner's permission, no other person can go upon the land to take the wildlife. State v. Mallory, 83 S.W. 955, 955–60 (Ark. 1904); Mille Lacs Band of Chippewa Indians v. Minnesota, 152 F.R.D. 587, 590 (D. Minn. 1993).

[105] "Unqualified property rights in wild animals can arise when removed from their natural liberty and made subjects to man's dominion." Wiley v. Baker, 597 S.W.2d 3, 5 (Tex. Civ. App. 1980). Because deer and elk in these intensively managed farms and ranches are held in captivity, they are no longer considered *ferae naturae*; instead they are viewed by the state as private property, although they remain subject to state regulation. *See, e.g.*, COLO. REV. STAT. § 35-41.5-104 (West 2002) (requiring "[a]ny person operating a farm or ranch at which alternative livestock are raised [to] obtain a valid alternative livestock farm license issued by the [state]"); *see also* Munninghoff v. Wis. Conservation Comm'n, 38 N.W.2d 712, 716 (Wis. 1949) (holding muskrats on a licensed farm that were purchased by landowner were private property).

[106] White, *supra* note 8, at 260–62. For a comprehensive examination of elk ranching, see IAN THORLEIFSON ET AL., ELK FARMING HANDBOOK (2000).

[107] *Id.*; MICHAEL L. WESTENDORF & BONNIE A. ALTIZIO, DEER AND ELK FARMING 3–4 (2000). Velvet antler has been used for more than 2,000 years in Asia and Europe; it is believed to "improve joint health, increase muscular strength, accelerate muscle recovery, support the

As a method of production, wildlife ranching has some advantages over traditional animal husbandry. Native species generally have ecological adaptations that enable them to more efficiently utilize available forage, often with a lesser impact to the environment.[108] Game ranching also potentially allows the rancher to use specialized and complementary feeding habits of wild and domesticated livestock to balance range use, thereby achieving higher production than possible with a single species.[109] For example, deer are typically browsers; that is they will consume a variety of trees, shrubs, and forbs.[110] The diet of domestic cattle is generally restricted to grasses and forbs.[111] If done judiciously, the addition of deer to a cattle-producing operation can yield a higher overall production without additional ecological damage.[112]

The overall size of the commercial game industry remains quite small compared to that for domestic livestock; however, today there are approximately 8,500 alternative livestock operations in 44 U.S. states and nearly 2,600 such facilities in the 13 Canadian provinces and territories.[113] Perhaps surprisingly, game ranching is more prevalent in the eastern and midwestern United States than the west—three eastern and midwestern states alone are responsible for nearly one third of all game ranches in the United States; seven of the top ten states with the most captive cervid facilities are east of the Mississippi River.[114]

B. Management of Game Ranches and Farms

Because captive cervids can be viewed as either wildlife or livestock, alternative livestock facilities generally are regulated either singularly or

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immune system and improve energy and stamina." NORTH AMERICAN ELK BREEDERS ASS'N, ANSWERS TO FREQUENTLY ASKED QUESTIONS REGARDING CHRONIC WASTING DISEASE (2001), *at* http://www.mneba.org/cwdfaq.pdf. In addition, "elk and deer ranches have provided a viable option for the family farmer and rancher, who have suffered from reduced incomes from grain crops, cattle, hogs and chickens." *Id.*

108 Neil Fairall, *Extensive Containment Systems: Game Ranching*, *in* WILDLIFE PRODUCTIONS SYSTEMS, *supra* note 7, at 243, 244.

109 *Id.*

110 Lowell K. Halls, *White-Tailed Deer*, *in* BIG GAME OF NORTH AMERICA 43, 56–58 (John L. Schmidt & Douglas L. Gilbert eds., 1978); Henry L. Short, *Nutrition and Metabolism*, *in* MULE & BLACK-TAILED DEER OF NORTH AMERICA 99, 113–14 (Olof C. Wallmo ed., 1981).

111 Harold F. Heady & R. Dennis Child, *Mixed Species Grazing*, *in* RANGELAND ECOLOGY & MANAGEMENT 209, 218 (1994).

112 Harold F. Heady & R. Dennis Child, *Mixed Species Management*, *in* RANGELAND ECOLOGY & MANAGEMENT, *supra* note 111, at 227, 234–36.

113 NAT'L WILDLIFE FED'N, A GUIDE TO REPORTING ON CHRONIC WASTING DISEASE 5, 11 (2002). The only states without captive cervid herds are Alaska, Massachusetts, Nevada, Rhode Island, South Carolina, and Utah. *Id.* at 4.

114 Michigan leads all states with approximately 980 facilities; Wisconsin contains approximately 950 facilities; Pennsylvania has approximately 730 game ranches or farms. *Id.* at 4. Colorado (835 facilities), Ohio (555), Illinois (500), Texas (500), New York (400), Minnesota (370), and Missouri (325) represent the remaining top 10 states with the most game ranches or farms. *Id.* Together, these 10 states are responsible for 72% of the captive cervid facilities in the United States.

jointly by two state agencies, the agency with jurisdiction over wildlife or the agency regulating agriculture.[115] This split regulatory scheme historically resulted in disparate treatment of alternative livestock facilities, depending on which agency regulated the game ranch.

Currently, there is a trend toward transferring regulatory authority from state wildlife agencies to state agriculture agencies.[116] The alternative livestock industry is driving this transfer, in part because they recognize that state wildlife agencies are more closely examining CWD transmission issues and because state agriculture agencies are generally less sensitive to wildlife disease concerns.[117] This is an important point that deserves reiteration: Wildlife agencies generally consider the potential impacts to free-ranging cervids in regulating alternative livestock facilities; however, agriculture agencies which oversee such facilities generally allow management practices that give little to no regard to potential impacts to free-ranging cervids—that is, agricultural regulators see the captive herd as livestock and not wildlife. Under agricultural schemes, captive cervids were screened for livestock-related diseases (brucellosis and tuberculosis are common examples), but agriculture agencies were ill-equipped for detecting and managing wildlife-related diseases such as CWD. As an illustration, many of the translocations of CWD-affected deer and elk from Colorado facilities occurred after 1994, during a transition period in which the regulation of commercial game ranches was transferred from the Division of Wildlife to the Department of Agriculture.[118]

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[115] In 9 states the state equivalent to the Department of Agriculture has jurisdiction over alternative livestock facilities raising native cervids (Del., Haw., Mich., Neb., N.D., Ohio, S.D., Tenn., and Wis.); in 9 states the state equivalent to the Department of Wildlife are charged with regulating facilities (Ala., Ariz., Ark., Kan., N.J., N.M., Or., Wash., and Wyo.); in 26 states facilities are managed jointly by the two departments (Cal., Colo., Conn., Fla., Ga., Idaho, Ill., Ind., Iowa, Ky., La., Me., Md., Minn., Miss., Mo., Mont., N.H., N.Y., N.C., Okla., Pa., Tex., Vt., Va., and W. Va.). MICHIGAN DEP'T OF NATURAL RESOURCES, *supra* note 3; NAT'L WILDLIFE FED'N, *supra* note 113, at 5–10.

[116] *Oversight Hearing on* Chronic Wasting Disease *Before the Subcomms. on Forests and Forest Health & Fisheries Conservation, Wildlife, and Oceans, Comm. on Res.*, 107th Cong. (2002) (statement of Wayne Pacelle, Senior Vice President for Communications and Government Affairs, The Humane Society of the United States) [hereinafter Pacelle Testimony], *available at* http://resourcescommittee.house.gov/107cong/forests/2002may16/pacelle.htm; *see, e.g.*, WISCONSIN DEP'T OF NATURAL RESOURCES, SUMMARY OF A STATEWIDE AUDIT AND INSPECTION OF WISCONSIN'S CAPTIVE WHITETAIL DEER FARMS 5 (2003) (On January 1, 2003, the regulation of Wisconsin white-tailed deer ranches was transferred to the Department of Agriculture, Trade & Consumer Protection from the Department of Natural Resources.), *available at* http://www.dnr.state.wi.us/org/es/enforcement/docs/DeerFarmAudit.pdf.

[117] Pacelle Testimony, *supra* note 116. In 1994, the authority for private elk herds was transferred from the Colorado Division of Wildlife to the Colorado Department of Agriculture. Todd Hartman, *Wildlife vs. Agriculture: Elk Ranching Reignites Duel*, ROCKY MTN. NEWS, June 1, 2002, at 7K, *available at* 2002 WL 9102368. This transfer of authority was the result of legislative pressure by the agricultural community, although "biologists warned that the elk ranches could speed up the spread of [CWD] into wildlife populations." *A Miscalculated Result*, DENVER POST, Oct. 3, 2001, at B6, *available at* 2001 WL 27667335.

[118] Hartman, *supra* note 117, at 7K. For example, a privately owned elk herd at Elk Echo Ranch, Colorado, may have been infected as early as 1995. Theo Stein, *Wasting Disease Traced to Ranch; Vet: A Closure of Elk Pen Would Have Limited Spread*, DENVER POST, Oct. 5, 2001, at

IV. MANAGEMENT OF CWD: PAST AND PRESENT

Until relatively recently, chronic wasting disease had been considered an obscure disease, affecting a small number of western states, and of interest to a relatively few professional biologists and wildlife managers.[119] This perception has undergone a radical shift following the disease detection in non-endemic areas throughout North America, and CWD is now considered a national and international problem of concern to public health officials, agricultural industries, wildlife managers and researchers, and the general public.[120]

Early CWD management programs were relatively rare, largely because of the absence of regulatory or economic pressure.[121] Those programs that did exist were primarily directed at the protection of private resources (*i.e.*, deer and elk in private ownership). The threat to large, public deer or elk herds was considered restricted to the relatively small endemic area. In spite of its modest beginnings, CWD management has increased logistically since the late 1990s.[122] Chronic wasting disease is now considered an immediate and severe threat to North American cervids and has dramatically altered the management of wild deer and elk.[123] To illustrate, consider that prior to the 1980s only a handful of state agencies had regulations concerning CWD; as of this writing, 30 states are developing or have developed new or additional CWD regulations, all 50 states now have regulations concerning captive cervid operations, and 47 states perform CWD testing on wild cervids.[124] The following sections present models of CWD management in captive and free-ranging cervids and provide suggestions for a nationally uniform management strategy.

A. Models for Preventing CWD Introduction into Captive Cervid Herds

Scientific uncertainty surrounds all TSEs, particularly CWD. There is still considerable question as to the exact method of transmission, both

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B1, *available at* 2001 WL 27667583. Elk raised on the Elk Echo Ranch were shipped to at least 15 states (Idaho, Ill., Ind., Kan., Minn., Mo., Neb., N.M., N.D., Okla., S.D., Tex., Utah, and Wis.) and 45 Colorado facilities. *Id.*; Stein, *supra* note 7.

119 Elizabeth S. Williams, *Chronic Wasting Disease of Deer and Elk: An Overview*, *in* CHRONIC WASTING DISEASE SYMPOSIUM, *supra* note 10, at 5.

120 *Id.*

121 Michael W. Miller, *Chronic Wasting Disease Surveillance and Monitoring Strategies: An Overview*, *in* CHRONIC WASTING DISEASE SYMPOSIUM, *supra* note 10, at 6.

122 Franklin et al., *supra* note 3, at 951–52; *see also* WISCONSIN DEP'T OF NATURAL RESOURCES, ENVIRONMENTAL IMPACT STATEMENT ON RULES TO ERADICATE CHRONIC WASTING DISEASE FROM WISCONSIN'S FREE-RANGING WHITE-TAILED DEER HERD 35–39 (2003) [hereinafter WISCONSIN EIS] (outlining recent state and federal management plans).

123 INT'L ASS'N OF FISH AND WILDLIFE AGENCIES, AN OVERVIEW OF CHRONIC WASTING DISEASE—A THREAT TO WILDLIFE 1, *available at* http://www.iafwa.org/Attachments/CWD%20Overview.pdf (last visited Nov. 16, 2003).

124 U.S. DEP'T OF AGRICULTURE ET AL., *supra* note 19, at 1–2; MICHIGAN DEP'T OF NATURAL RESOURCES, *supra* note 3 (All 50 states now have CWD-related regulations, ranging from the implementation of additional testing requirements to the banning of all cervid importation.).

laterally (*i.e.*, from animal to animal) and maternally (*i.e.*, from dam to fawn).[125] As a result, several techniques have evolved for the management of the disease and prevention of its transmission. Early management required no testing or monitoring for CWD; however, since the recent spread of the disease, this technique is no longer widespread and will not be discussed further.[126] Two extant management models involve restrictions on cervid imports, either complete bans or bans from CWD-affected areas.[127] The final method requires imported cervids be certified as CWD-free and come from herds with approved monitoring programs.[128]

The most effective technique to limit exposure to CWD in non-endemic areas logically seems to be a complete ban on all cervid imports into CWD-free states. At this writing, 25 states have permanent or emergency regulations banning all cervid importation.[129] Complete bans on importation, however, may be unnecessary if a live-animal testing method is developed and proven effective.

The second method to limit the spread of CWD to unaffected areas is to ban importation of all cervids from areas in which CWD is endemic or from any area that has had an identified case of CWD. Currently, 23 states follow this approach.[130] However, due to the difficulty in detecting the agent, this

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125 Williams et al., *supra* note 33, at 293–94. Current research is beginning to point to lateral rather than maternal transmission as the primary route for infection. Michael W. Miller & Elizabeth S. Williams, *Horizontal Prion Transmission in Mule Deer*, 425 NATURE 35 (2003) ("The demonstration of abnormal prion protein in gut-associated lymphoid tissues but not in placental tissues of mule deer . . . is consistent with an alimentary shedding route, as has been suggested for scrapie." (internal citations omitted)).

126 MICHIGAN DEP'T OF NATURAL RESOURCES, *supra* note 3.

127 *Id.*

128 *Id.*

129 *Id.* (Ala., Alaska, Ariz., Ark., Conn., Ga., Ill., Ind., Ky., La., Me., Md., Mass., Mich., N.H., N.J., N.M., N.Y., N.C., Or., Pa., S.C., Vt., Va., and Wash.); *e.g.*, ALA. ADMIN. CODE r. 220-2-.26 (2002) ("No person, firm, corporation, partnership, or association shall possess, sell, offer for sale, import, bring or cause to be brought or imported into the State of Alabama any . . . member of the family Cervidae . . . ."); N.C. ADMIN. CODE tit. 15A, r. 10B.0101 (2003) (emergency rule banning importation of live cervids in to North Carolina); N.Y. COMP. CODES R. & REGS. tit. 6, § 189.2 (2002) (prohibiting the importation of all wild or captive-bred cervids). Enforcement issues further complicate complete bans on importation and a small amount of illegal trafficking in wildlife will undoubtedly still occur. *See, e.g.*, Hagener v. Wallace, 47 P.3d 847 (Mont. 2002) (Despite knowledge that their actions were illegal under Montana law, ranchers transferred and released 68 captive-bred elk onto the Crow Indian Reservation.); Missouri v. Pollock, 914 S.W.2d 1 (Mo. Ct. App. W.D. 1995) (Upon learning that he would not be issued a permit to keep a white-tailed deer fawn he had found in Missouri, the defendant shipped the fawn to Tennessee in order to prevent a Missouri game warden from recovering the animal.); Press Release, Arizona Game & Fish Department, Wildlife Officials Concerned that Deer Rescues Could Spread Disease (July 7, 2003) (expressing concern that people may attempt to rescue "abandoned" or "orphaned" deer fawns and elk calves, potentially spreading disease), *available at* http://www.gf.state.az.us/nrm/archives/wn_070703.html.

130 MICHIGAN DEP'T OF NATURAL RESOURCES, *supra* note 3 (Cal., Colo., Del., Fla., Idaho, Ill., Iowa, Kan., Minn., Miss., Mo., Mont., Neb., Nev., N.D., Okla., R.I., S.D., Tenn., Utah, W. Va., Wis., and Wyo.); *e.g.*, ILL. ADMIN. CODE tit. 8, § 85.120(d)(3) (2002) (banning importation if the cervid "originate[s] from a CWD endemic area (any county and surrounding counties where CWD has been diagnosed in the past five years)"); S.D. ADMIN. R. 12:68:25:17(3) (2002) (Prior to importation, "[a]ll certificates of veterinary inspection also must have the following statement

method may not prove completely effective in preventing the spread of the disease. Because the agent has a prolonged period of dormancy, animals that apparently originate from a CWD-negative herd or area may in fact be infected with the abnormal prion.[131] Until an effective antemortem test is developed, a ban only on importation from areas in which CWD has definitively been identified has limited reliability.

Many states have implemented mandatory CWD monitoring, testing, and certification programs for alternative livestock operations.[132] Most certification plans require enrollment in a sixty-month surveillance program and ban importation from any herd in which CWD has been identified.[133] In addition, many CWD certification programs include "trace-back" or "trace-forward" requirements in which the shipments of individual animals are recorded so that the movement of any animal later determined to have contracted CWD may be determined and any herd with which the animal has been in contact may be identified.[134] Again, without a proven effective and economical antemortem testing method, monitoring and certification may not prove effective to prevent further introductions of CWD into non-endemic areas.

B. CWD Detection in Free-Ranging Deer and Elk

Management agencies must conduct CWD surveillance to detect the disease in free-ranging cervids. In order to understand completely the distribution of CWD, three types of surveillance methods are utilized—targeted, hunter harvest, and outbreak surveillance.[135] Targeted surveillance involves the collection of deer or elk that exhibit outward signs of CWD.[136]

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with the signature of the cervid owner attesting validity. 'No animal has ever originated from, or been a member of a herd, where CWD has been diagnosed, or been a member of a CWD traceback or traceforward herd in the past five years.'" (internal citations omitted)).

131 See Section II.D, *supra*, for a discussion on the nature of the infectious agent and its implications to wildlife managers.

132 MICHIGAN DEP'T OF NATURAL RESOURCES, *supra* note 3. Currently, 22 states require certification prior to translocation or are developing similar surveillance regulations *Id.* (Colo., Fla., Idaho, Ill., Iowa, Kan., Minn., Miss., Mo., Mont., Neb., Nev., N.D., Ohio, Okla., R.I., S.D., Tenn., Tex., Utah, Wis., and Wyo.); *e.g.*, 8 COLO. CODE REGS. § 1205-2(14.1) (2002) ("A mandatory CWD surveillance program shall be applicable to all Colorado licensed alternative livestock facilities . . . ."), *available at* http://www.ag.state.co.us/ag_crr/brands/HTML/ALTERNATIVE%20LIVESTOCK%20ACT.htm; ILL. ADMIN. CODE tit. 8, § 85.120(e)(5) (2002) ("For [C]ervidae changing ownership or moving within the State, the owner must obtain a permit issued by the Department prior to movement and originate from a herd that is enrolled in [a CWD monitoring program]."); 4 TEX. ADMIN. CODE § 51.10 (2002) (requiring at least five years of health monitoring before importation and participation in a CWD monitoring program if the cervid originates from an area known to have CWD).

133 MICHIGAN DEP'T OF NATURAL RESOURCES, *supra* note 3.

134 *See, e.g.*, IOWA ADMIN. CODE r. 21-64.108(163) (2003) ("Traceback must be performed for all animals diagnosed at an approved laboratory as affected with CWD. All herds . . . having contact with affected animals . . . must be investigated epidemiologically [and all herds] having contact with affected animals or exposed animals must be quarantined.").

135 U.S. DEP'T OF AGRICULTURE ET AL., *supra* note 19.

136 *Id.* See Section II.C, *supra*, for a discussion of the clinical symptoms of CWD.

This method is used in areas in which harvest cannot easily be conducted, for example within city limits or game reserves. Hunter harvest surveillance involves the collection of samples from harvested deer and elk.[137] Hunter harvest is a critical early detection method and frequently provides wildlife managers with the initial detection of the disease in areas in which the disease was not previously identified.[138] The third surveillance method is outbreak surveillance. Outbreak surveillance is the collection of a specified number of animals to determine the rate of infection and the extent of the infected area, either identified though targeted or hunter harvest surveillance.[139] Currently, 47 states perform some type of CWD surveillance and testing on free-ranging deer and elk and 2 additional states are developing similar plans.[140]

C. Other CWD-Related Regulations

In addition to efforts to prevent the introduction of CWD via live-animal translocations, many states have implemented complex regulations governing baiting or feeding wildlife and movements of animal parts intra- and interstate.[141] Feeding can be done recreationally (to attract deer for wildlife watching, for example) or supplementally (to maintain a herd during critical forage conditions, typically during late fall and winter).[142] Baiting is

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137 U.S. DEP'T OF AGRICULTURE ET AL., *supra* note 19. While harvest-based surveillance is cost effective, it usually assumes that individual deer or elk are harvested randomly. However, the behavioral changes associated with CWD may increase or decrease the probability of CWD-affected animals being harvested, and thereby bias harvest-based estimates of CWD prevalence. *See* Mary M. Conner et al., *Detection of Bias in Harvest-Based Estimates of Chronic Wasting Disease Prevalence in Mule Deer*, 36 J. WILDLIFE DISEASES 691 (2000) (describing potential bias in harvest-based sampling).

138 For example, the initial detections of CWD in free-ranging deer in Saskatchewan, Minnesota, Nebraska, New Mexico, South Dakota, Utah, and Wisconsin were made through hunter harvest surveillance. Williams et al., *supra* note 2, at 557; Minnesota Board of Animal Health, *supra* note 6; UTAH DIV. OF WILDLIFE RESOURCES, *supra* note 6.

139 U.S. DEP'T OF AGRICULTURE ET AL., *supra* note 19.

140 MICHIGAN DEP'T OF NATURAL RESOURCES, *supra* note 3 (Hawaii has no plans to develop or implement CWD testing for free-ranging cervids.).

141 *Id.*; *see, e.g.*, CAL. CODE REGS. tit. 14, § 251.3 (2002) ("No person shall knowingly feed big game mammals...."); CAL. CODE REGS. tit. 14, § 712 (2002) (With a few exceptions for butchered or processed venison, "[n]o hunter harvested deer or elk (cervid) carcass or parts of cervid carcass shall be imported into the State....").

142 WISCONSIN EIS, *supra* note 122, at 82. One of the most well known examples of supplemental feeding occurs in Jackson Hole, Wyoming. For nearly 100 years, Wyoming has provided supplemental feed during the winter months, resulting in one of the two largest elk herds in the world. U.S. FISH & WILDLIFE SERVICE, *Background Information on Elk and Bison*, *in* NATIONAL ELK REFUGE AND GRAND TETON NATIONAL PARK BISON AND ELK MANAGEMENT PLAN/EIS, *available at* http://bisonandelkplan.fws.gov/background%20page.html (last visited Nov. 16, 2003). Unfortunately, the program has also resulted in a "marked loss of woody plant communities, such as willow and aspen stands, which are important habitat for songbirds, moose, and mule deer" and the creation of "conditions that are conducive to the transmission and maintenance of currently endemic diseases as well as diseases that may be introduced in the future." *Id. See also* MONT. ADMIN. R. 12.9.104(1) (2002) ("Past experience in Montana and elsewhere has shown that artificial feeding of game animals is not a sound game management program—neither economically nor biologically.... It can only be justified under extreme

the placement of feed for the purpose of attracting or habituating deer or elk to a hunting location.[143] Baiting and feeding operations artificially concentrate cervids into relatively small areas.[144] This increases animal-to-animal contact and potential exposure to CWD-infected animals, thereby increasing the likelihood of disease transmission.[145] Because of this increased risk of infection and transmission, 8 states do not allow the feeding of free-ranging cervids[146] and 22 states do not allow the baiting of cervids.[147]

Because of the incredible persistence of TSE agents and the potential for environmental contamination, many states have implemented restrictions on the importation of hunter-harvested deer and elk.[148] While prion protein is concentrated in nervous and lymphatic tissues,[149] prohibitions on importation generally allow hunter-harvested venison to be

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winter conditions which indicate a winter loss of major proportions [of the wildlife population] is imminent.").

143 WISCONSIN EIS, *supra* note 122, at 82.

144 *Id.*

145 *Id.*; WYOMING GAME & FISH DEP'T, CHRONIC WASTING DISEASE MANAGEMENT PLAN (2002) ("Private feeding may lead to localized concentrations of environmental contamination with the CWD agent."), *available at* http://gf.state.wy.us/wildlife/wildlife_management/cdwplan.asp; TIMOTHY R. VAN DEELEN, CHRONIC WASTING DISEASE AND THE SCIENCE IN SUPPORT OF THE BAN ON BAITING AND FEEDING DEER (2003), *available at* http://www.dnr.state.wi.us/org/land/wildlife/Whealth/issues/Cwd/cwdscsu.pdf. For an in-depth analysis of the potential environmental impacts of deer baiting and feeding, and the resulting social and economic impacts of banning feeding or baiting, see WISCONSIN EIS, *supra* note 122, at 82–93.

146 MICHIGAN DEP'T OF NATURAL RESOURCES, *supra* note 3 (Ala., Alaska, Cal., Colo., Ill., Mont., N.Y., and Wis.); *e.g.*, ILL. ADMIN. CODE tit. 17, § 635.40 (2002) ("It shall be illegal to make available food, salt, mineral blocks or other products for ingestion by wild deer or other wildlife in areas where wild deer are present."); N.Y. COMP. CODES R. & REGS. tit. 6, § 189.3 (2002) (banning feeding of white-tailed deer in New York, except as a by-product of bona fide agricultural purposes). Not all bans on feeding and baiting have been met with public approval however. For example, in March 2003, a Wisconsin state legislative committee directed the Wisconsin Department of Natural Resources to relax its temporary ban on baiting and feeding in direct response to the concerns of citizen groups. Lee Bergquest & Meg Jones, *DNR Told to Relax Deer Feeding Ban*, MILWAUKEE J. SENTINEL, Mar. 28, 2003, at 1B ("The baiting and feeding ban [has] emerged as the most controversial aspect of the DNR's fight against [CWD]."), *available at* 2003 WL 3313994. The State's Joint Committee for Review of Administrative Rules subsequently let the temporary rule lapse, opting to not extend the rule as requested by the state Natural Resources Board. Press Release, Wisconsin Department of Natural Resources, Emergency Rule Banning Baiting and Feeding of Deer Allowed to Lapse (Apr. 30, 2003), *available at* http://www.dnr.state.wi.us/org/caer/ce/news/rbnews/2003/043003co.htm. A permanent rule was expected to be implemented in September 2003, again banning the feeding and baiting of deer in Wisconsin. *Id.*

147 MICHIGAN DEP'T OF NATURAL RESOURCES, *supra* note 3 (Ala., Alaska, Cal., Colo., Ga., Idaho, Ill., Ind., Me., Mass., Mich., Minn., Miss., Mont., N.M., N.Y., Pa., R.I., Tenn., Va., Wis., and Wyo.); *e.g.*, ALASKA ADMIN. CODE tit. 5, § 92.085 (2003) (prohibiting the use of baits for all ungulate hunting); 2 COLO. CODE REGS. § 406-0 (2002) ("[N]o person shall place, deposit, distribute or scatter grain, hay, or other foods so as to intentionally constitute a lure, attraction or enticement for big game not lawfully held in captivity.").

148 MICHIGAN DEP'T OF NATURAL RESOURCES, *supra* note 3.

149 Williams et al., *supra* note 2, at 560 (The "brain, spinal cord, lymph nodes, spleen, tonsils, and eyes . . . contain the greatest amount of CWD agent in infected animals . . . .").

imported if the carcass has been properly processed to remove these regions of potentially high prion concentration.[150] Twelve states have implemented regulations banning the importation of hunter-harvested cervid parts[151] and six states are discussing similar bans.[152]

D. Responses to CWD Once Detected

No vaccines or treatments for the prevention of CWD infection exist; as a result, few options exist for managing CWD in free-ranging cervid populations.[153] Those management options that are available are based almost entirely on some form of population management.[154] Because the transmission of CWD is thought to be density dependant—it is transmitted more easily at higher population densities[155]—some states have implemented selective culling operations, selectively removing specific animals in specified areas.[156] These culls either entail reductions of the densities of cervid populations or the complete depopulation of specific herds.[157] Of course, culling efforts are not without controversy, and several

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150 *See, e.g.*, CAL. CODE REGS. tit. 14, § 712 (2003) (allowing hunters to import "(a) boned-out meat and commercially processed cuts of meat; (b) portions of meat with no part of the spinal column or head attached; (c) hides with no heads attached; (d) clean skull plates (no meat or tissue attached) with antlers attached; (e) antlers with no meat or tissue attached; (f) finished taxidermy heads"); ILL. ADMIN CODE tit. 17, § 635.30 (2003) (establishing similar import allowances).

151 MICHIGAN DEP'T OF NATURAL RESOURCES, *supra* note 3 (Cal., Colo., Ill., Iowa, Minn., N.M., N.Y., N.D., Or., R.I., Utah, and Vt.); *e.g.*, 2 COLO. CODE REGS. § 406-0, art. VII(B)(9) (2002) (making it "unlawful to import dead deer or elk from any other state or country . . . which has been diagnosed as positive for Chronic Wasting Disease (CWD) in the wild, except for [properly prepared carcasses]"); N.Y. COMP. CODES R. & REGS. tit. 6, § 189.3(d) (2003) (banning the importation of specific parts of "wild [cervids] taken in or originating from the states of Colorado, Wyoming, South Dakota, Wisconsin, Minnesota, New Mexico, Nebraska, Kansas, Oklahoma, Montana, Illinois, Utah, or the Canadian provinces of Saskatchewan or Alberta, or such parts from captive or captive-bred [cervids] obtained from outside New York").

152 MICHIGAN DEP'T OF NATURAL RESOURCES, *supra* note 3 (Ky., Mich., Mont., N.C., Okla., and Pa.).

153 Gross & Miller, *supra* note 2, at 209; Williams et al., *supra* note 2, at 559 ("Models of CWD epidemic dynamics suggest early, aggressive intervention via selective culling or more generalized population reduction show the greatest promise of preventing new endemic foci from being established . . . .").

154 Gross & Miller, *supra* note 2, at 209.

155 WISCONSIN EIS, *supra* note 122, at 72.

156 Williams et al., *supra* note 2, at 559 ("Nebraska, Saskatchewan, and Wisconsin [are implementing] aggressive reductions of deer numbers in newly identified foci . . . in attempts to eliminate CWD from these areas.").

157 *See* MARK VIEIRA, COLORADO DIV. OF WILDLIFE, RED FEATHER–POUDRE CANYON DEER HERD MANAGEMENT PLAN 15–16 (2001) (recommending up to 50% reductions in deer herds in areas with high concentrations of CWD), *available at* http://wildlife.state.co.us/hunt/DeerMngmtPlans/RedFeather.pdf; MARK VIERA & JANET GEORGE, COLORADO DIV. OF WILDLIFE, BIG THOMPSON DEER HERD MANAGEMENT PLAN 2–3 (2001) (recommending at least a 15% reduction in deer population, with the potential for higher population reductions in areas with high concentrations of CWD), *available at* http://wildlife.state.co.us/hunt/DeerMngmtPlans/BigThompson.pdf; Press Release, Colorado Division of Wildlife, DOW Continues CWD Management Effort On Western Slope (Apr. 11, 2002)

organizations have voiced concerns over efforts to reduce population densities via culling.[158]

One or two cases of CWD in a previously uninfected area may be enough to initiate culling. For example, in Colorado, wildlife officials were immediately dispatched to an area surrounding an elk ranch on which two deer were identified with CWD.[159] In Wisconsin, the initial detection of three CWD-affected deer led to the immediate sampling of deer within a 1,075 square-kilometer (415 square-mile) area, revealing a prevalence level of approximately 3% in the free-ranging white-tailed deer population.[160] Within two months of detection, the Wisconsin Department of Natural Resources announced a plan to reduce the deer population in a 1,064 square-kilometer (411 square-mile) area to near zero and reduce the deer population in ten surrounding counties by approximately 50%.[161] This response culminated in a statewide plan to depopulate areas in which CWD is detected and reduce herd densities in areas immediately surrounding the depopulated areas.[162]

Because the effects of culling are not completely known, some states have elected to implement a more wait-and-see approach.[163] Management areas in which culling is not conducted provide scientists an opportunity to evaluate the success of culling at preventing the further spread of CWD.[164] For example, Colorado's deer management plan calls for the reduction of the deer population in one management unit by 50%; in a management unit in

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(After the detection of CWD in two deer near an elk ranch, wildlife officers were immediately directed "to kill deer found within a five-mile [eight-kilometer] radius of where the two positive animals were found" in an effort to stop the spread of the disease.), *available at* http://dnr.state.co.us/news/press.asp?pressid=1846; WISCONSIN EIS, *supra* note 122, at 48–71 (setting a population goal of near zero in areas in which CWD is present).

158 *See, e.g.*, BENNETT, *supra* note 1 ("[State wildlife agencies] did everything they could to foster the proliferation of deer in obscene numbers for hunters' targets—and now they are madly rushing to contain the disease that has resulted from their stupidity and greed by conducting wholesale slaughter of the deer and elk."); Pacelle Testimony, *supra* note 116 ("We believe that it is unreasonable to advance a massive kill of wild cervid populations in the absence of compelling scientific justification for the effectiveness of this type of action.").

159 Press Release, Colorado Division of Wildlife, *supra* note 157.

160 *Timeline: Chronic Wasting Disease from Beginning to Present*, MILWAUKEE J. SENTINEL, Oct. 20, 2002, at 16A, *available at* 2002 WL 24019257. To contrast the 3% prevalence rate of CWD in localized white-tailed deer populations in Wisconsin, disease prevalence in localized populations within the endemic areas of Colorado and Wyoming have been reported as high as 15% in mule deer and 1% in elk. Christopher N. Jacques et al., *Prevalence of Chronic Wasting Disease and Bovine Tuberculosis in Free-Ranging Deer and Elk in South Dakota*, 39 J. WILDLIFE DISEASES 29 (2003).

161 *Timeline: Chronic Wasting Disease from Beginning to Present*, *supra* note 160.

162 WISCONSIN EIS, *supra* note 122, at 48–81.

163 *See, e.g.*, WYOMING GAME & FISH DEP'T, *supra* note 145 ("It currently has not been established that it is possible to reduce the prevalence of CWD in an endemic area, and large-scale efforts to reduce prevalence of CWD could have more severe effects on deer and elk populations than does CWD . . . [therefore] research in Colorado, and elsewhere, will be monitored.").

164 JEFF VER STEEG, COLORADO DIV. OF WILDLIFE, CHRONIC WASTING DISEASE UPDATE 1 (Feb. 26, 2003) (on file with author).

Wyoming with a similar infection rate, officials are not conducting culling, thereby creating an experimental control.[165]

Management of CWD outbreaks in captive cervid herds is generally more uniform between states, largely because the Animal and Plant Health Inspection Service (APHIS) has implemented a buyout program for captive, CWD-affected cervids.[166] Under the program, CWD suspect or exposed deer or elk are removed from the herd, euthanized, and tested for the disease.[167] Although APHIS intends primarily to pay indemnity for whole-herd depopulations, indemnity is also available for individual animals removed for testing.[168] The indemnity payment is set at 95% of the appraised value of the animal, up to $3,000 per animal.[169] In 2002, $12.5 million was available to indemnify deer and elk ranchers.[170] The indemnity program also requires ranchers to clean and disinfect their premises after the cervids are removed.[171]

The APHIS buyout program is voluntary and some cervid ranchers may choose not to participate; state agencies maintain the authority to regulate deer and elk ranchers whose herds have been identified to contain CWD-infected animals. Under many state laws, strict reporting requirements are placed upon alternative livestock operators.[172] Therefore, even if a rancher chooses not to participate in the federal indemnity program, state agencies are still able to identify CWD outbreaks in captive cervid herds. Once CWD cases are identified, state agencies generally impose a quarantine on the entire affected herd until either the herd is depopulated or a specified time period elapses, typically four or five years.[173]

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165 *Id.*

166 Chronic Wasting Disease in Cervids; Payment of Indemnity, 67 Fed. Reg. 5925 (Feb. 8, 2002) (codified at 9 C.F.R. pt. 55).

167 *Id.* at 5927.

168 *Id.*

169 *Id.*; *e.g.*, Stein, *supra* note 7, at B4 (In October, 2001, APHIS offered to buy 245 elk in 15 states traced to a Colorado elk ranch infected with CWD.).

170 VER STEEG, *supra* note 164, at 2.

171 67 Fed. Reg. at 5928 ("All structures on the premises, including barns, stockyards, and pens used to house the cervids, all cars and other conveyances used to transport the cervids, and the materials on those premises or conveyances must be cleaned and disinfected under the supervision of an APHIS employee or state representative . . . ."). However, because of the resistance of the CWD agent, these disinfection efforts ultimately may be unsuccessful. See Section II.D, *supra*, for a discussion of the resistance of the CWD agent.

172 *See, e.g.*, ARIZ. ADMIN. CODE R3-2-402 (2001) (mandating that all suspected or confirmed cases of CWD must be reported to the state veterinarian within four hours of detection); ILL. ADMIN. CODE tit. 8, § 85.10 (2002) (requiring all cases of CWD be immediately reported to the Illinois Department of Agriculture); IND. ADMIN. CODE tit. 345, r. 1-6-2 (2001) (requiring clinical diagnosis of CWD be reported to the state veterinarian within two days); IOWA ADMIN. CODE r. 21-64-1(163) (2002) (requiring prompt reporting); 4 TEX. ADMIN. CODE § 40.2 (West 2002) (establishing mandatory CWD surveillance and reporting); WASH. ADMIN. CODE § 16-70-010 (2002) (requiring suspected or confirmed cases of CWD be reported immediately to the state veterinarian).

173 *See, e.g.*, ILL. ADMIN. CODE tit. 8, § 85.120 (2002) (requiring quarantine upon diagnosis of CWD until either the herd has been depopulated or there has been no evidence of CWD in the herd for five years); IND. ADMIN. CODE tit. 345, r. 2-7-5 (2001) (establishing similar quarantine requirements, however the state veterinarian may require additional clean-up and disinfection

E. Federal Management Thus Far

Until recently, the federal government treated CWD as a regional problem, concerning only a few western states.[174] However, as the disease began to be found in previously CWD-free areas, this attitude began to change, and culminated in the issuance of a Declaration of Emergency by the Department of Agriculture in 2001.[175]

Several factors led to the emergency declaration. Chronic wasting disease had been identified in 14 captive elk herds in Colorado, Montana, Nebraska, Oklahoma, and South Dakota, only some of which had been depopulated.[176] The full extent of CWD infection in farmed elk in the United States remains unclear.[177] In addition, limited funds were available for research and indemnity programs and no CWD program was in place; as a result, APHIS had conducted only minimal surveillance and testing.[178] The Secretary also feared CWD becoming a widespread and costly problem similar to that of mad cow disease in Europe.[179]

The emergency declaration identified a need for a federal program in which APHIS would take a stronger role to document the prevalence of the disease and halt its further spread.[180] Since the declaration, APHIS has developed its indemnity program and is developing a national CWD management plan to establish requirements for interstate movement of farmed deer and elk.[181] While the indemnity program has been implemented, the national CWD management plan has been slow in development. The National CWD Plan Implementation Committee[182] identified the immediate

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of the facility); IOWA ADMIN. CODE r. 21-64.109 (2002) (The quarantine of a source herd "shall be removed after four years of compliance."); KAN. ADMIN. REGS. 9-29-15 (2002) (establishing a quarantine of at least four years after the removal of the CWD-affected animal); S.D. ADMIN. R. 12:68:25:06 (2002) (requiring a five-year quarantine period).

174 Williams, *supra* note 119, at 5.

175 Declaration of Emergency Because of Chronic Wasting Disease, 66 Fed. Reg. 49,342 (Sept. 27, 2001).

176 *Id.*

177 *Id.*

178 *Id.*

179 *Id.* In the United Kingdom by 1989, more than 7,000 cases of BSE were being confirmed annually, leading to international restrictions on the importation of beef from the United Kingdom. Taylor, *supra* note 30, at 506. By 1995, "more than 150,000 cattle had been infected [and] 34% of all farms with adult breeding cattle had experienced at least one case." *Id.* at 507. In 1996, scientists first recognized a link between BSE and vCJD, leading to widespread monitoring and testing of beef destined for human consumption. Will et al., *supra* note 29; FOOD SAFETY & INSPECTION SERVICE, U.S. DEP'T OF AGRICULTURE, DOCKET NO. 01-027N, CURRENT THINKING ON MEASURES THAT COULD BE IMPLEMENTED TO MINIMIZE HUMAN EXPOSURE TO MATERIALS THAT COULD POTENTIALLY CONTAIN THE BOVINE SPONGIFORM ENCEPHALOPATHY AGENT 2–4 (2002), *available at* http://www.fsis.usda.gov/oa/topics/BSE_Thinking.pdf.

180 66 Fed. Reg. at 49,342.

181 Chronic Wasting Disease in Cervids; Payment of Indemnity, 67 Fed. Reg. 5,925 (Feb. 8, 2002); Unified Agenda, 67 Fed. Reg. 74,057, 74,074–75 (Dec. 9, 2002). See Section V.A, *infra*, for a discussion of the statutory authority allowing APHIS to develop a CWD management plan.

182 Members of this committee are charged with the development and implementation of the National CWD Plan and include state and federal wildlife managers. NAT'L CWD PLAN IMPLEMENTATION COMM., IMPLEMENTATION DOCUMENT FOR PLAN FOR ASSISTING STATES, FEDERAL

need for a national program to control the movement of farmed cervids.[183] The Committee anticipated a publication date by November 30, 2002 with plan implementation as soon as possible thereafter; however, the proposed rule has not yet been made available.[184]

In addition to administrative actions, the 107th Congress proposed several bills to provide a multi-agency cooperative effort to control and monitor the spread of the disease and encourage further research.[185] The proposed bills contained provisions to develop population models to better predict the spread of CWD in wild cervid populations,[186] a mandate requiring the Secretary of Interior to conduct a CWD surveillance and monitoring program on federal lands,[187] and required sampling and testing protocols be developed by the Secretaries of Agriculture and Interior.[188] Further, the proposals called for APHIS to coordinate with state management agencies to develop a plan for monitoring CWD in captive cervids with the goal of reducing spread of the disease.[189] Finally, the proposals would have authorized appropriations of several million dollars for CWD research and management.[190] Unfortunately, none of these proposals passed.

The 108th Congress again proposed several bills to provide a multi-agency management approach and assistance to state and tribal governments.[191] The 2003 proposals largely mirrored the 2002 proposals.

AGENCIES AND TRIBES IN MANAGING CHRONIC WASTING DISEASE IN WILD AND CAPTIVE CERVIDS 30 (2002) [hereinafter CWD PLAN IMPLEMENTATION DOCUMENT], *available at* http://www.ngpc.state.ne.us/wildlife/cwd/implement.pdf.

183 *Id.* at 13. The U.S. Departments of Agriculture and Interior delivered to Congress a national plan on June 27, 2002; however, the plan contained no specific actions to limit interstate movements of captive cervids. Press Release, USDA, Interior Deliver Chronic Wasting Disease Management Plan to Congress (Jun. 27, 2002), *available at* http://www.aphis.usda.gov/lpa/news/2002/06/cwdplanv.html; U.S. DEP'T OF AGRICULTURE ET AL., *supra* note 19.

184 CWD PLAN IMPLEMENTATION DOCUMENT, *supra* note 182, at 13; *see also Joint Legislative Hearing on H.R. 2057 Before the Subcomms. on Fisheries Conservation, Wildlife, and Oceans & Forests and Forest Health, Comm. on Resources*, 108th Cong. (2003) (testimony of Bobby R. Acord, Administrator, Animal & Plant Health Inspection Service) (a national cervid herd certification program is now expected by the end of 2003), *available at* http://resourcescommittee.house.gov/108cong/forest/2003jun19/acord.htm.

185 S. 2560, 107th Cong. (2002) (proposing a multi-agency cooperative CWD research effort); H.R. 4795, 107th Cong. (2002) (companion bill to S. 2560); S. 3090, 107th Cong. (2002) (proposing sampling guidelines and testing protocols for testing of CWD); H.R. 5608, 107th Cong. (2002) (companion bill to S. 3090); H.R. 4740, 107th Cong. (2002) (proposing a national research program).

186 S. 2560 § 101.

187 *Id.* § 102.

188 *Id.* § 202; H.R. 4740 § 2; S. 3090 § 3.

189 S. 2560 § 203.

190 S. 2560 (authorizing $28.5 million); H.R. 4795 (authorizing $27 million).

191 S. 1036, 108th Cong. (2003) (proposing multi-agency cooperative CWD research effort); H.R. 2057, 108th Cong. (2003) (companion bill to S. 1036); H.R. 2430, 108th Cong. (2003) (proposing amendment to the Fish & Wildlife Coordination Act, 16 U.S.C. §§ 661–666c (2000), to increase CWD research and monitoring); H.R. 2431, 108th Cong. (2003) (proposing a National Chronic Wasting Disease Task Force); S. 1366, 108th Cong. (2003) (proposing additional federal grants to state and tribal governments to assist in the management and control of CWD); H.R. 2636, 108th Cong. (2003) (companion to S. 1366).

One proposal would authorize $20.5 million to help state and tribal wildlife agencies improve their CWD management programs.[192] These funds would be distributed to states in the following priority order: 1) states with CWD already detected in its wild cervid population and adjoining states; 2) states that have expended state funds to manage, monitor, survey, or research CWD; 3) states that have collaborated throughout the implementation process to develop a comprehensive and integrated CWD policy and program; and 4) states that wish to develop a rapid response mechanism for new CWD outbreaks.[193] While this proposal would establish a funding mechanism that states could tap into annually, it does not specify the percentage of funds available to each funding priority.

A second proposal would establish an additional $21 million to provide technical assistance to states conducting CWD research, to implement wildlife management plans, and to promote public education programs in affected states.[194] Federal assistance under this proposal would be limited to states with CWD occurring in free-ranging deer and elk populations and is unavailable to states with CWD only in captive cervid herds.[195]

Additionally, a third proposal would establish a National Chronic Wasting Disease Task Force charged with addressing the environmental and economic problems associated with CWD in free-ranging and captive cervid populations.[196] The Task Force would be composed of 1) the Secretaries of Agriculture and Interior; 2) up to 15 representatives of state agencies and nongovernmental organizations, each appointed jointly by the Secretaries and representative of the geographic distribution of CWD; and 3) the Chairman or ranking member of the House Resources, House Agriculture, Senate Environment and Public Works, and Senate Agriculture Committees.[197] The Task Force would be responsible for implementing a national CWD management plan and developing an annual budget in order to do so.[198]

V. SUGGESTIONS FOR FUTURE CWD MANAGEMENT

A. Authority for Federal Management

Federal agencies are authorized by federal statute to make rules and regulations in order to prevent the spread of infectious disease through interstate commerce.[199] Under the Animal Health Protection Act,[200] the

192 S. 1366 (authorizing $7.5 million to states with existing CWD management plans, $10 million to states with CWD outbreaks, and $3 million to tribal wildlife management agencies to develop CWD management plans); H.R. 2636 (same).

193 S. 1366 § 3.

194 H.R. 2430.

195 *Id.*

196 H.R. 2431.

197 *Id.*

198 *Id.*

199 3A C.J.S. *Animals* § 74 (2002).

200 7 U.S.C.A. §§ 8301–8317 (West Supp. 2002).

Secretary of Agriculture may promulgate rules prohibiting or restricting the interstate transportation of any animal necessary to prevent the introduction or dissemination of any pest or disease of livestock.[201] Additionally, the Secretary may order the destruction or removal of any animal necessary to prevent the introduction or dissemination of any pest or disease of livestock.[202] The term "livestock" in the Act refers to "all farm-raised animals."[203] The Act further expressly classifies prions as a "pest" of livestock.[204] Because captive cervids are farm-raised animals, they should qualify as livestock under the Act. Chronic wasting disease is a prion disease; thus, CWD qualifies as a pest of livestock. Therefore, the Secretary of Agriculture has the authority to regulate the interstate commerce of captive cervids to prevent the introduction or dissemination of CWD pursuant to the Animal Health Protection Act.

The Secretary has exercised this authority recently by promulgating regulations governing the interstate transportation of sheep and goats to prevent the transmission of scrapie, a prion disease.[205] The National Scrapie Program provides that no sheep or goat can be "sold, transported, received for transportation, or offered for sale or transportation in interstate commerce" unless certain requirements are fulfilled.[206] Each animal destined for interstate commerce must be individually identified, either with an electronic implant, official ear-tags or back-tags, or marked with official registry tattoos.[207] Additionally, all animals being transported must be accompanied by a state-issued certificate or permit.[208] To participate in the program, states must also require livestock owners to comply with a five-year monitoring program.[209] Finally, a single facility may maintain multiple flocks, provided that the flocks never commingle and are kept at least nine meters (thirty feet) apart or are separated by a solid wall preventing contact.[210] While the specific method of transmission between individuals is different between scrapie and CWD, the Scrapie Program could serve as a useful model for federal CWD management because the requirements outlined within the Scrapie Program are similar to those which should be implemented in CWD management.

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201 *Id.* § 8303(a).

202 *Id.* § 8303(c)(1).

203 *Id.* § 8302(10).

204 *Id.* § 8302(13)(I).

205 National Scrapie Program, 9 C.F.R. §§ 79.1–79.7 (2003).

206 *Id.* § 79.2(a). In limited circumstances, certain low-risk livestock may be transported without restriction. *Id.* § 79.3.

207 *Id.* § 79.2(a)(2).

208 *Id.* §§ 79.3, 79.5. Animals prohibited from movement may, however, be transported interstate if they are destined for destruction or research and accompanied by a permit. *Id.* § 79.3.

209 *Id.* § 79.6(a)(5)(iv).

210 *Id.* § 79.1.

B. Federal Permits for Alternative Livestock Operations

Chronic wasting disease is unlike any epidemic faced by wildlife managers; it is a unique disease that is associated with a unique method of transmission. As a result, to prevent the spread of the disease via human caused transmission routes, live animal translocations and alternative livestock operations must be strictly monitored.[211] Because there is little uniformity among state regulations, a federal permit system should be implemented that regulates the operation of game ranches and farms and imposes strict requirements prior to live animal translocations.[212] The next sections outline several elements key to managing CWD in alternative livestock operations.

1. Prevention of Introduction

Although debate remains concerning the spread of CWD via live animal translocation, it is certain that a significant risk for CWD introduction exists in live animal movement.[213] To address this risk, many states have restricted the importation of live deer and elk.[214] While these efforts are to be commended, they may prove unsuccessful due to the uncertainty of monitoring program implementation and the prolonged incubation period of the disease.[215] Until an effective live test is developed, the Secretary of Agriculture should implement a temporary ban on interstate transportation of all captive cervids to prevent the spread of CWD to unaffected areas. This ban should only be in place until a live test is available or until sufficient time has lapsed to definitively show that captive cervids are in fact CWD-negative. Once an antemortem test is available and live animal transport resumes, no animal should be transported from any facility that has not been monitored for at least sixty months.[216] The sixty-month surveillance requirement will provide a second level of protection in the event that an

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211 Pacelle Testimony, *supra* note 116; CWD PLAN IMPLEMENTATION DOCUMENT, *supra* note 182, at 13.

212 Pacelle Testimony, *supra* note 116 ("CWD and wild cervid populations do not recognize state boundaries and, as long as some states continue to allow the importation of cervids, their neighboring states remain at risk. That fact buttresses the case for Federal action in halting interstate transport of cervids."); *see also* E.S. Williams & M.W. Miller, *Chronic Wasting Disease in Deer and Elk in North America*, 21 REVUE SCIENTIFIQUE ET TECHNIQUE 305, 306 (2002) ("[T]he spread of CWD in the cervid industry is highly unpredictable because animal movements are commercial, essentially random, and inadequately regulated in many locations. Undetected spread via trade of infected animals will probably continue until uniform surveillance programmes are adopted and enforced.").

213 Williams et al., *supra* note 2, at 552; INT'L ASS'N OF FISH AND WILDLIFE AGENCIES, *supra* note 123, at 2 ("Live animal movement (captive and wild) within and across borders is the greatest risk factor and must be controlled immediately.").

214 MICHIGAN DEP'T OF NATURAL RESOURCES, *supra* note 3; INT'L ASS'N OF FISH AND WILDLIFE AGENCIES, *supra* note 123, at 2.

215 Declaration of Emergency Because of Chronic Wasting Disease, 66 Fed. Reg. 49,342 (Sep. 27, 2001) (identifying the incubation period of up to five years).

216 The 60-month requirement is considered a reasonable period to ensure that CWD is not present in a captive herd. Williams et al., *supra* note 2, at 556–57.

animal is actually infected, but the infection has not yet progressed to the level detectable by the test.

2. Isolation of Captive Herds

Deer and elk are social animals and as such engage in many activities involving direct contact between animals.[217] Prolonged animal-to-animal contact is one possible vector for disease transmission, although minimal contact through fencing probably does not present an excessive transmission risk.[218] Because of the strong disposition to form social groups, a single fence between captive and wild deer and elk is insufficient to prevent prolonged contact. In addition to fence-line contact, possible transmission routes from captive to wild populations include entry into the enclosure and subsequent escape of free-ranging deer or elk and the escape of captive cervids.[219] For these reasons, the Secretary of Agriculture should require facilities to erect a second perimeter fence at a distance sufficient to prevent fence-line contact. While this is a costly measure, a second barrier is essential to prevent contact between captive and wild cervids.[220] In addition, a second barrier will provide added protection against the unintentional release of captive deer and elk into wild populations and protect against the entrance of wild cervids into the enclosure. Regardless of the direction of the spread of CWD between wild and captive cervids, double fencing of captive herds will serve as an effective barrier to CWD transmission.[221]

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217 Stephen Demarais et al., *White-Tailed Deer*, *in* LARGE MAMMAL ECOLOGY, *supra* note 8, at 601, 608–09. In white-tailed deer, female social units consist of an adult female, her current fawns, and a number of female offspring from previous years. *Id.* at 608. Adult males are more gregarious and social interactions are limited; however, "mutual grooming and dominant–subordinate interactions occur commonly." *Id.* at 609. Mule deer are not as social as white-tailed deer, but social interactions are still very common. John G. Kie & Brian Czech, *Mule and Black-Tailed Deer*, *in* LARGE MAMMAL ECOLOGY, *supra* note 8, at 629, 637. Rocky Mountain elk exhibit an affinity to form large herds of up to 100 members with frequent animal-to-animal contact occurring to establish and maintain social bonds. Michael J. Wisdom & John G. Cook, *North American Elk*, *in* LARGE MAMMAL ECOLOGY, *supra* note 8, at 694, 699–700.

218 Williams et al., *supra* note 2, at 557.

219 Miller & Thorne, *supra* note 11, at 461. For example, in March 2003, a state inspection found that 182 of the 550 white-tailed deer ranches in Wisconsin have had captive deer escape from pens into the wild at some point in the history of the operation. WISCONSIN DEP'T OF NATURAL RESOURCES, *supra* note 116, at 8. The inspection revealed at least 671 white-tailed deer escaped, of which 436 were never recovered. *Id.*

220 A properly constructed, 2.5-meter (8-foot) fence costs between $10,000 per mile and $30,000 per mile, depending on terrain and soil conditions. *E.g.*, THORLEIFSON ET AL., *supra* note 106, at 279, 283 (estimating fencing costs between $10,000 and $14,000 per mile); VER STEEG, *supra* note 164, at 3 (noting that the construction of a 16 kilometer (10 mile) perimeter fence costs approximately $300,000).

221 INT'L ASS'N OF FISH AND WILDLIFE AGENCIES, *supra* note 123, at 2–3.

3. Surveillance and Depopulation of Infected Herds

Detection of CWD in wild and captive deer and elk herds is vital to target specific areas for disease control.[222] To that end, once an antemortem test is available, the Secretary of Agriculture should require all animals to be tested prior to any movement and periodically thereafter to insure no reinfection or infection from an outside source occurs. In the event CWD is detected in a captive population, the affected population should immediately be destroyed and the livestock owner compensated under the APHIS indemnification program. The facility should not be repopulated until decontamination protocols have been developed. These extreme measures will ensure that the source of infection is removed promptly and the possibility of reinfection is limited.[223]

C. Recommendations for Uniform State Management

Free-ranging deer and elk herds historically have fallen under state jurisdiction, and should remain so; however, to protect free-ranging deer and elk populations, some level of uniformity among state management programs should be developed. Several proposals have been advanced by both state and federal agencies.[224] Many elements are present in most plans and should be implemented on a nation-wide level by state and federal agencies. Agencies should continue outbreak and harvest-based surveillance to monitor the status and distribution of CWD.[225] When a new disease focus is identified, agencies should promptly reduce the affected population and any population identified near the new outbreak. This prompt reduction in cervid density will help reduce the possibility of disease transmission and continued existence in the area.[226] To further reduce deer and elk density, feeding or baiting of cervids should be eliminated.[227] Supplemental feeding tends to congregate animals in restricted areas, increasing population density and the likelihood of disease transmission; therefore feeding programs should not be implemented unless there is an imminent threat of major population losses due to extreme winter conditions.[228] Many other suggestions have been made concerning the management of CWD; however, if the few outlined in this Comment are implemented uniformly among state

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222 *Id.*

223 Williams et al., *supra* note 2, at 558 ("Until effective cleaning and disinfection procedures are identified, or evidence provided that environmental contamination does not pose a risk, farmed cervids should not be reintroduced into facilities where CWD has occurred . . . .").

224 *Id.* at 558–59; INT'L ASS'N OF FISH AND WILDLIFE AGENCIES, *supra* note 123, at 2.

225 U.S. DEP'T OF AGRICULTURE ET AL., *supra* note 19 (In wild cervid populations, control of CWD "is most feasible with early detection of new disease foci."); INT'L ASS'N OF FISH AND WILDLIFE AGENCIES, *supra* note 123, at 3 ("Detection of CWD in wild and captive cervids is vital to target areas for disease control.").

226 Gross & Miller, *supra* note 2, at 214.

227 Williams et al., *supra* note 2, at 559.

228 PETERSON ET AL., *supra* note 18, at 11.

and federal agencies, the likelihood of disease transmission will be greatly reduced.

VI. CONCLUSION

For decades, chronic wasting disease was considered a local issue of concern only to western wildlife managers; however, recent outbreaks of the disease in formerly CWD-free areas across the country show that CWD must be dealt with on a national level. While significant uncertainty surrounds the exact method of infection and spread of the disease, alternative livestock operations have been shown to be one vector by which CWD is spread. Currently, there is little uniformity in state regulation of alternative livestock operations. As a result, the federal government should intervene and implement a nationally uniform program to regulate the operation of alternative livestock operations and the transportation of captive cervids. In addition, state agencies should be encouraged to develop aggressive CWD management plans to identify and eradicate, if possible, new disease foci. Dealing with CWD will be difficult, expensive, and require extensive cooperation; however, without effective and immediate management, CWD will continue to be a severe threat to the deer and elk of North America.