REPORT OF THE COMMITTEE ON WILDLIFE DISEASES

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The Committee met on Tuesday, October 26, 2004. At least 60 people, including 30 committee members, attended the meeting. Reports were provided concerning ongoing and emerging wildlife health issues of interest to United States Animal Health Association (USAHA) and its members. Summaries of these reports follow.

Implementation of the Interagency Bison Management Plan by the Yellowstone National Park

Dr. Glenn Plumb, United States Department of Interior (USDI), National Park Service (NPS), Yellowstone National Park (YNP), updated the committee on the activities related to the Interagency Bison Management Plan. Much of the controversy surrounding bison management at YNP revolves around the fact that approximately 50% of the bison are known to have been exposed to brucellosis. While brucellosis has been known from this population since early in the last century, the proportion of bison that are infectious at any time of the year is unknown.

The use of spatial and temporal separation of bison from cattle on private and public lands surrounding YNP provides a significant assur-

ance to prevent the transmission of brucellosis from wild bison to domestic livestock. To further minimize the risk of transmission, cattle that occupy Special Management Areas (SMA) are being vaccinated for brucellosis. Implementation of the Interagency Bison Management Plan (IBMP) demonstrates a commitment to eventual eradication of brucellosis from the YNP bison population. The interagency partners have agreed to work within their respective authorities and areas of jurisdiction to implement deliberate, stepwise measures that manage the risk of transmission while building a foundation for the eventual elimination of brucellosis in the bison population.

Nearly all YNP bison select habitats within YNP during the summer months. However, the winter landscape makes forage less available to bison because of snow depth and snow structure characteristics. Thus, the areas available to bison during the most difficult months of winter are extremely small relative to year around distribution. Special management areas along the north and west boundaries of YNP have been designated to direct our management program which will in turn protect the brucellosis class free status for the state of Montana. Three separate zones are defined within each special management area.

Zone 1 = An area within YNP where bison are managed more intensively to assure that bison do not commingle with cattle on lands immediately outside the park.

Zone 2 = An area immediately outside YNP where bison will eventually be provided winter habitat, for use from November 1st through either early or mid May.

Zone 3 = An area immediately outside Zone 2 where bison will be intercepted and hazed back in to acceptable tolerance areas, or removed if necessary.

YNP is collaborating with two other federal and two state agencies to implement the IBMP. The management plan has two main objectives, to protect a free ranging wild population of bison and manage the population in a way that will avoid the risk of brucellosis transmission from bison to cattle (United States Department of Interior and United States Department of Agriculture (USDA) 2000). The key principles of the management strategy include the spatial and temporal separation of bison from cattle; a core area of suitable bison winter range outside YNP that will be phased in for bison use as increasing numbers of bison and cattle are vaccinated and; finally a minimum population size to protect the conservation value of this unique and valuable genome.

Bison that enter the SMA and challenge the area of tolerance are subject to a moderately complex management decision process. This decision process is what generates the vast majority of conflict between constituencies and the interagency partnership. Hazing is considered as a management tool for implementing the spatial and tem-

poral separation of bison and cattle. Should hazing become ineffective at managing bison distribution, bison will be captured. The decision regarding how to handle captured bison is an agency specific decision depending on which SMA bison are captured. At present, there are only two options: In early winter, disease management is the primary focus. In late winter, if the population is greater than 3,000 bison, agencies have the option to initiate population control measures by cropping bison, only if they are captured in the SMA, or continue testing bison captured to further pursue disease management goals.

The IBMP has been implemented for four years now. Accomplishments currently are being reviewed by an interagency review team and will be incorporated into the IBMP administrative record. Hazing of bison to manage distribution on the winter range has been initiated in both SMA's during each of the four winters of operation. Patterns that have evolved in the west SMA show that groups of adult male bison are generally 10 or less and hazing occurs from late September until early June. In general, movements into the SMAs by groups of adult females begin in late winter and run well in to the parturition period. Movement of bison into the northern SMA, by groups of adult females, occurs earlier than at the west SMA and ceases prior to parturition. Movements by adult males into SMA's constitute a lower proportion of the hazing events at the northern SMA. Over the last few years, population abundance has leveled off around 4,000 animals. In three of those four years more than 200 bison per year have been removed from the population by management actions.

The results of the status review will provide the interagency managers information regarding whether to move to the second step in our adaptive management procedures. While some challenges still exist, the plan is moving forward in accomplishing both of the established goals. Spatial and temporal separation of bison and cattle has been successful.

The IBMP also directs NPS to initiate a program to vaccinate bison. The contingency was that vaccinating bison at the SMA's would be initiated once a safe vaccine was identified. A review of the literature describing the bio-safety parameters of RB51 was completed and signed in to the administrative record by the YNP Superintendent. In the spring of 2004, 113 calf and yearling bison were vaccinated at the north SMA.

In addition to in-chute parenteral vaccination of bison at the north SMA, NPS has a responsibility to develop a strategy for delivering vaccine to free-ranging bison that never go to the SMA's. In order to move forward with remote vaccination, NPS must complete an environmental planning process to evaluate the alternatives. We anticipate this process to take 18 months with an expected decision document being issued in January of 2006. The purpose and need for this planning

process are five fold:

- Meet the NPS mission to preserve native wildlife species as a component of a naturally operating ecosystem and protect them from exotic organisms;
- Address the NPS responsibility to implement the IBMP;
- Decrease the probability of individual bison shedding *Brucella* organisms;
- Demonstrate systematic progress in further reducing risk of transmission from bison to livestock; and
- Decrease the percentage of YNP bison infected with brucellosis.

Remote delivery of a brucellosis vaccine presents many challenges. Delivery tools are currently limited with ballistic delivery of vaccine in bio-absorbable bullet packages showing the most promise. Two research groups have suggested that ballistic delivery of RB51 vaccine may require a greater dose than would be recommended through syringe injection delivery, and that short distances are required for the BTI pneumatic delivery system to be successful. YNP has studied those challenges to evaluate the feasibility of success in developing a remote delivery vaccination program. A partnership with Colorado State University has resulted in new ideas for encapsulating the RB51 vaccine. Photo encapsulation of vaccine has been shown to be successful in the laboratory. A relatively high percentage of the live bacteria in the vaccine dose survive the photo polymerization process. In addition, the ballistics of the hydrogel delivery package are very comparable to the traditional bio-bullet system. Field trials are currently in progress to compare the efficacy of this encapsulation methodology with the traditional lyophilization and compaction method.

Field evaluations of bison behavior have led to greater confidence in closely approaching bison consistently. A park based program is in place for gaining new knowledge about movement patterns using a system of randomly placed radio transmitting devices to monitor individual animal movements. In addition, aerial surveys by park biologists combined with ground based monitoring aid in documenting abundance of the population and seasonal distribution.

An interagency surveillance program to monitor brucellosis prevalence is also in place led by Montana/Animal and Plant Health Inspection Service (APHIS) at the west SMA and by NPS at the North SMA. Blood samples are collected from bison captured at the SMA's and serology tests are conducted to determine exposure to *Brucella abortus*. A small sample of bison is randomly captured by NPS field staff throughout the park and tested for brucellosis exposure as well.

In conclusion, the IBMP protects the State of Montana's interests by maintaining the Brucellosis class -free status designated by APHIS

and when fully implemented should systematically reduce the incidence rate of brucellosis-infected animals. The IBMP also concurrently achieves the NPS Mission by conserving YNP bison population and providing for suitable core winter range areas outside of YNP. The interagency partnership continues to implement the IBMP in a very deliberate manner utilizing transparent decision trees and a documented administrative record.

Wyoming Governor's Brucellosis Coordination Team Update

Dr. Frank Galey, Dean, College of Agriculture, University of Wyoming, reported to the Committee on the activities of the Wyoming Governor's Brucellosis Coordination Team. Wyoming has experienced several new cases of brucellosis (due to *Brucella abortus*) in cattle in the past year. The cases of most interest are in the Greater Yellowstone Area. One case was directly traced to an elk origin whereas the other is very likely due to elk or bison due to reported commingling of animals. As a result of these cases, the Governor and Legislature of the State of Wyoming formed a Wyoming Brucellosis Coordination Team, with Dr. Galey as Chair. This team consists of 29 individuals including 19 members and 10 technical advisors charged with developing a list of issues, best management practices, and recommendations for four topics. Those topics include managing brucellosis in cattle and minimizing transmission between species, how the state's agencies should best respond to subsequent cases, human health implications, and lastly, how to reduce and eventually eliminate brucellosis from the state's wildlife paying special attention to the elk feeding grounds. The team was given one year to complete this task. It has covered the first three topics in detail and is currently working on the last topic (wildlife brucellosis). General recommendations developed by the team and current progress on the recommendations related to wildlife were reported to the Committee. The recommendations included:

- Development of Brucellosis Action Management Plan by each elk winter feedgrounds in order to reduce contact with cattle at times of high risk of disease transmission;
- Continued surveillance for brucellosis exposed animals, beyond reinstatement of Class Free status for Wyoming; and
- Research on *Brucella abortus.*

Additional wildlife-related issues recognized by the Team include the density of elk and bison herds in the Jackson Hole, Wyoming area and the need for continuing cooperation with federal partners including the U.S. Fish and Wildlife Service and NPS.

Greater Yellowstone Interagency Brucellosis Committee Update

Dr. Tom Linfield, Montana State Veterinarian, provided an update on the activities of the Greater Yellowstone Interagency Brucellosis Committee (GYIBC) during the calendar year of 2003. The GYIBC was established in 1995, when a Memorandum of Understanding (MOU) was signed by the Secretaries of the Departments of Interior and Agriculture and the Governors of Montana, Wyoming, and Idaho, in an effort to collectively address problems caused by brucellosis in the Greater Yellowstone Area (GYA). Member agencies represented in GYIBC include the state and federal agencies responsible for management of wildlife, livestock, and lands in the GYA. The GYIBC has an Executive Committee, a Technical Subcommittee, and an Information and Education Subcommittee. The goal of the GYIBC is to protect and sustain the existing free-ranging elk and bison populations in GYA and protect public interests and economic viability of the livestock industries of Idaho, Montana, and Wyoming. A major focus of GYIBC is to facilitate development and implementation of brucellosis management plans to control and eventually eliminate brucellosis from wildlife in the GYA. In 2003, the Executive Committee recognized the need for an annual report in order to inform numerous and diverse stakeholders of GYIBC activities. The following report covers calendar year 2003:

The Executive Committee recognized the need to revise and update the original MOU. Significant changes were to more aggressively address brucellosis elimination from the GYA and to include Tribal representation on the GYIBC. This is addressed by including the Chairman of the Board of Directors of the Inter-Tribal Bison Cooperative (ITBC) to represent Native American Tribes.

The last year of a three-year study was conducted to determine environmental persistence of *Brucella abortus* (strain RB51) in infected fetal tissues. Bacilli remained viable for 80-90 days when placed in the environment in February versus 20-30 days when fetuses were placed in May. The third year of a fetal disappearance study also was conducted and showed that fetuses placed in YNP were scavenged more rapidly that those placed in adjacent environs. On average, fetuses were scavenged within 18 days, although disappearance times ranged from 1-78 days. Approximately half of the fetuses moved more than 100 feet, with one moved more than two miles across a frozen lake.

A study was proposed to determine the feasibility of a quarantine process for sero-negative bison calves from YNP. If successful, “disease-free” bison may be considered for YNP bison conservation efforts and potential restoration projects on suitable state, federal, and tribal lands.

The first report of disease caused by *B. abortus* in Rocky Mountain bighorn sheep was documented at the Wyoming Game and Fish

Department's Sybille Wildlife Research Laboratory. Nine (four females and five males) captive sheep were infected with *B. abortus* biovar 4 following natural exposure to a fetus aborted by a research elk.

Additional topics summarized in D. Linfield's report included:

- Detection of a cattle herd apparently infected via contact with infected elk on feedgrounds adjacent to the cattle operation. Following detection of a second infected cattle herd, Wyoming lost Class-Free status;
- Ninety-eight hazing operations were conducted around YNP boundaries;
- The 2003 Montana legislature authorized the Montana Fish, Wildlife, and Parks Commission to consider initiating a bison hunt. An environmental review of the proposed hunt is scheduled for completion in the fall of 2004. If Montana elects to move forward with a hunt; it could begin as early as the fall of 2004;
- The Idaho Fish and Game Department hired a veterinarian in October 2003, who has completed a work plan addressing issues and goals of the Governor's Brucellosis Task Force report. Developing and implementing management practices to separate cattle and elk, decrease and eventually eliminate elk dependence on winter feeding, and conducting surveillance are primary objectives of the plan.
- A total of 570 elk were trapped and tagged, and 27 test-eligible female elk were bled for serological testing at six Wyoming feedgrounds as part of the Wyoming Game and Fish Department's integrated Brucellosis-Feedgrounds-Habitat program. A total of 2,569 elk calves were vaccinated at 19 feedgrounds. The Strain 19 vaccination program was initiated in 2003 for the first time since the program that ran from 1989-1991 on the National Elk Refuge (NER). Habitat improvement projects were greatly hindered by the continuing drought in Wyoming;
- Sero-positive rates from 1-4 per cent were found among hunter-killed elk in Montana elk management units within the GYA indicating relatively low brucellosis exposure and infection among these animals;
- Analysis of seven different proposed alternatives including options for controlling brucellosis that would not require reductions in winter feeding or numbers of elk on the NER was conducted as part of continued work on the Bison and Elk Management Plan for the NER and Grand Teton National Park; and

- Several Information and Education-oriented activities occurred, including public hearings and a panel discussion featuring Governors from three states and Undersecretaries from the Departments of Agriculture and Interior. The GYIBC website was revitalized and can be accessed at GYIBC.COM.

Progress Report on the National CWD Management Plan and Federal Funding

Dr. Tom Thorne, Wyoming Department of Game and Fish, updated the committee on activities directed toward the goals established in the national plan for managing chronic wasting disease (CWD) in free-ranging and captive cervids, as well as on federal funds provided to support these activities and the needs for additional federal funds. In 2002, a task force of Federal and State agency representatives, co-chaired by the Director of the U.S. Fish and Wildlife Service and the Administrator of USDA-APHIS, prepared the Plan for Assisting State, Federal, and Tribal Agencies in Managing Chronic Wasting Disease in Wild and Captive Cervids (National CWD Management Plan). Subsequently, an Implementation Document was prepared by another state/federal working group. The Implementation Document contained specific responsibilities and budgetary needs for full implementation of the National CWD Plan. Although the Implementation Document was widely circulated, the U.S. Office of Management and Budget (OMB) did not approve it because of budgetary figures it contained; and therefore it was not officially implemented by Federal agencies.

United States Department of Agriculture (USDA), Animal and Plant Inspection Service (APHIS), Veterinary Services (VS), received federal funds to assist agencies with CWD management activities in captive, commercial cervids and free-ranging cervids in FY2003 and FY2004; however, the limited funding fell far short of meeting projected needs. Despite inadequate funding and failure of the federal government to formally adopt the Implementation Document, many elements of the National CWD Management Plan are being implemented on a piece-meal basis by state and federal agencies. Congressional support for additional funding has not been forthcoming, in part because some members of Congress believed little was being done to address CWD in free-ranging cervids and that funding was adequate. Consequently, it was decided at the 2003 meeting of the International Association of Fish and Wildlife Agencies (IAFWA) that a Progress Report on the National CWD Management Plan might clear up some misconceptions regarding state and federal efforts to manage CWD in free-ranging cervids. IAFWA took the lead in report preparation and invited USDOI and the USDA to participate, and a small working group was established.

The working group met in St. Louis, MO in January 2004, to initiate

preparation of the progress report. Subsequent activities of the working group were carried out via email and telephone. The Progress Report followed the National CWD Management Plan and the Implementation Document in order to demonstrate CWD management progress according to the National CWD Management Plan. The USDA and USDOI were required to obtain OMB approval of the draft progress report, which resulted in difficulties because the report included projections of future budgetary needs and references to the Implementation Document.

After negotiations with OMB, references to the Implementation Document were deleted and the Progress Report was released in May 2004. In order to keep members of Congress informed of budgetary needs to fully address CWD in free-ranging cervids on a national scale, IAFWA proposed a budget summary based on the Implementation Document and the Progress Report. On September 9, 2004, 17 members of Congress used the Progress Report and IAFWA budgetary summary to prepare a letter sent to OMB encouraging additional funding for CWD management in free-ranging cervids and urging OMB to finalize the National CWD Management Plan.

Update on CWD Epidemiology Research

Dr. Michael Miller, Colorado Division of Wildlife, provided a brief update on analyses of CWD epidemiology data from mule deer (*Odocoileus hemionus*) populations in Larimer County, Colorado. Preliminary analyses have revealed it is likely that temporal, spatial, and demographic factors all influence prevalence patterns observed in naturally infected populations, and that recent management actions may have affected recent temporal trends. Dr. Miller reported spatial heterogeneity in CWD prevalence among wintering mule deer subpopulations, marked difference in CWD prevalence by sex and age groups, and clear local trends of increasing prevalence over a 7 year period that largely preceded management intervention. For both deer sexes, prevalence peaked in middle-aged animals; however, this differential was substantially larger for males. Dr. Miller concluded that demographic, spatial, and temporal factors all appear to contribute to the marked heterogeneity in CWD prevalence in endemic portions of north central Colorado, and that these factors likely combine in various ways to influence epidemic dynamics and responses to management on both local and broad geographic scales.

USDA-APHIS-VS Assistance for State CWD Surveillance and Management

Dr. Dean Goeldner, USDA, APHIS, Veterinary Services (VS) summarized the activities of USDA-APHIS-VS related to CWD. In FY 2004, APHIS received $18.5 million in appropriated CWD funding, including

$2.25 million in congressionally earmarked funding. The remainder was divided between the VS captive cervid program and support of free-ranging wildlife activities for the States, Tribes, and USDA-APHIS-Wildlife Services (WS) research and evaluation of rapid test technology.

Regarding captive deer and elk, USDA-APHIS is finalizing the proposed rule titled *Chronic Wasting Disease Herd Certification Program and Interstate Movement of Captive Deer and Elk* (published in the Federal Register on December 24, 2003), as well as the Uniform Methods and Rules document that will provide field guidance for the implementation of the final rule. In August 2004 USDA-APHIS-VS has issued an internal memo which provides procedures for defining areas where CWD has become established in wildlife and will consider purchase and depopulation of captive herds in those defined areas, regardless of their known exposure to CWD, because of their high-risk status.

In FY03, more than 12,000 farmed cervids were tested for CWD and 15,172 were tested in FY 2004. Since surveillance began in 1997, 29 farmed elk herds and 5 farmed white-tailed deer herds have been identified as CWD-positive herds. At this time, three positive elk herds remain in Colorado and two positive deer herds remain in Wisconsin. All are under State quarantine. USDA-APHIS-VS continues to offer indemnity and cover depopulation, disposal and testing costs for CWD-positive and exposed herds and trace animals. Due to smaller than anticipated indemnity expenditures in FY2004, VS was able to provide some one-time, end-of-year cooperative agreement funding to State agencies that manage CWD programs for farmed cervids, as well as some additional funding for Tier 1 State wildlife management agency cooperative agreements.

Regarding free-ranging deer and elk, USDA-APHIS-VS worked with IAFWA this year to develop an application and reporting template for USDA-APHIS-VS cooperative agreement funding with the State wildlife agencies. This template tracks expenditures as elements of the CWD National Plan and will make reporting to Congress on the implementation of the plan easier. USDA-APHIS-VS continues to solicit guidance from IAFWA on the formula structure for distributing cooperative funding to State wildlife agencies for CWD surveillance and management. In total, more than $5.4 million was distributed in FY 2004 through this program. All 50 States once again received funding. Points of interest from the FY 2004 application process: More States appear to be screening wildlife samples with rapid antigen-based test kits. While some States are doing more hunter-killed cervid surveillance, others are doing less and the overall trend in surveillance appears to be slightly downward. In addition, while some States focus almost exclusively on hunter-killed cervid surveillance, others are fo-

cusing primarily on targeted surveillance of symptomatic animals. Further discussion is needed on appropriate long-term surveillance strategies for CWD. Differences also still exist in the definition of a population and on the validity of multi-year sampling strategies. Finally, not all States are using the previously described template.

Most State reports for FY 2003 cooperative agreement activities have not yet been received by USDA-APHIS-VS. It would be helpful to have previous year reports prior to approving current year applications; however, this may not always be realistic. Nevertheless, it is imperative that these reports be submitted as soon as possible so that USDA-APHIS-VS can account for how the funds are being spent. The States also are reminded that funds not spent or obligated prior to the end of the cooperative agreement period cannot be carried over and must be returned to the U.S. Treasury.

USDA-APHIS-VS support for Tribal CWD activities was set at $750,000 for FY 2004. Again, a large portion of this cooperative agreement funding went to the Native American Fish and Wildlife Society to support its regional CWD biologists and assistance to tribes in their regions. However, 19 individual Tribes were awarded smaller cooperative agreements for CWD surveillance activities.

USDA-APHIS-VS continues to support research with USDA-APHIS-WS, including work on appropriate fencing for captive cervids and possible vaccine development. The USDA-APHIS Center for Veterinary Biologics has also approved four rapid test kits for use in wild cervid CWD surveillance testing at CWD contract laboratories.

USDA-APHIS-VS has had extensive discussions with the U.S. Environmental Protection Agency (EPA) on a variety of CWD-related issues, including 1) CWD-related waste disposal from diagnostic laboratories in EPA Region 8; 2) an EPA Office of Solid Waste memo on recommendations for the landfilling of CWD-positive carcasses; and 3) Section 18 exemptions under the Federal Insecticide, Fungicide and Rodenticide Act for the use of bleach, sodium hydroxide and Environ LpH as disinfectants for transmissible spongiform encephalopathy agents, including CWD.

USDA-APHIS-VS worked with United States Department of Interior (USDOI) and the States, via IAFWA, to produce the Progress Report on the CWD National Plan. This report was released and presented to Congress in May. USDA-APHIS-VS continues to work with its Federal, State and Tribal partners to implement the national plan within the framework of the federal budgeting process.

Wildlife Disease Research at the National Wildlife Research Center

Dr. Bob McLean, USDA-APHIS-WS National Wildlife Research Center (NWRC) provided a time-specific paper on their research ac-

tivities. The full text of the paper can be found in the Scientific Papers section of the Proceedings.

Wildlife Disease Surveillance by USDA-APHIS-WS

USDA-APHIS-WS concluded the first round of hiring for the Wildlife Disease Surveillance and Emergency Response Program (Program) during FY 2004. Twenty-three Wildlife Disease Biologists (WDB), an Assistant Disease Coordinator, a National Environmental Protection Act (NEPA) Coordinator, an Administrative Assistant and a Staff Officer were hired to build a basis for full-time wildlife disease monitoring and surveillance. Nine of the WDB's were hired for the Western Region, and 14 WDB's were hired for the Eastern Region. The rest of the positions, including the Wildlife Disease Coordinator, were strategically located across the United States to best administer the Program.

A major component of the Program is the ability of WDB's to quickly mobilize and provide assistance with emergency disease control efforts and a summary of related activities follows: USDA-APHIS-WS received a request for assistance with the Washington State bovine spongiform encephalopathy (BSE) Task Force in the depopulation of 450 feeder calves. The BSE Task Force leaders praised WS employees for quick response and hard work for accomplishing loading operations two hours ahead of schedule despite difficult weather conditions. The Program responded to two requests from the Texas Animal Health Commission (TAHC) to collect wildlife and feral animals associated with two outbreaks of avian influenza. Blood, trachea swabs and anal swabs were collected from the animals. WS has provided assistance to Florida to assist with relief efforts from Hurricane Ivan. This assistance has been in the form of conducting surveys of damaged animal facilities.

Disease activities conducted by the WDB's included technical assistance, surveillance, and control of numerous diseases including West Nile Virus, plague, rabies, swine diseases, bovine tuberculosis histoplasmosis, trichomoniasis, bovine brucellosis, scrapie, etc. The following are provided as examples of some the Program accomplishments: The Program was responsible for assisting with CWD surveillance in 17 states and the District of Columbia. Surveillance activities fell primarily into two categories: sampling conducted on hunter-harvested animals and sampling conducted on animals taken during wildlife damage management. The Program is assisting in Oregon and California with surveillance of deer-hair-loss syndrome by providing lice samples from deer. The sampling was extended statewide in Oregon and included both white-tailed and mule deer. Additional samples from black-tailed deer were taken in Northern California. Many states have requested assistance with West Nile Virus (WNV) monitoring. For example, Illinois and Missouri employees cooperated on one project to

collect 190 samples from birds in the St. Louis, Missouri area. In Maryland and New Jersey, samples were taken from resident Canada geese captured during wildlife damage management and submitted to state health department laboratories for analyses.

The following training activities were by WDB's: Wildlife Chemical Immobilization and Euthanasia Training; Necropsy and Biological Sample Collection; Incident Command System 100 and 200; Personal Protective Equipment; Emergency animal Disease Preparedness and; Immobilization and Euthanasia.

Activities at the USDA-APHIS-WS-NWRC included establishment of a fully functioning Biosafety Level-2 research diagnostic laboratory to support its new wildlife disease research program; identification of a promising surveillance system for WNV in nesting cliff swallows: overwintering WNV positive ectoparasites were found in swallow nests. This finding is significant because it indicates early season amplification of the virus, giving it an efficient jump-start within the cliff swallow ecosystem each year prior to amplification in the general avian community.

NWRC scientists were contracted by the Centers for Disease Control to conduct a survey of small wild mammals and their exposure to West Nile virus. Field surveillance in five states carried out by NWRC researchers and their WS operational counter-parts indicated that raccoons, opossum, *Peromyscus* mice, and fox squirrels all are commonly exposed to WNV. Pending investigations under experimental laboratory settings will determine the extent to which these species are amplifying hosts.

Current and Topical Information for Managers Interested in Wildlife Diseases

Dr. Leslie Dierauf, Director of the United States Department of Interior, U.S. Geological Survey (USGS), National Wildlife Health Center (NWHC) provided a summary on diseases of interest to wildlife managers. Avian vacuolar myelinopathy (AVM) is an emerging neurologic disease of wild birds in the southeastern United States. The disease was first recognized in bald eagles (*Haliaeetus leucocephalus*) at DeGray Lake, Arkansas in 1994, and 2 years later, was confirmed in a number of American coots (*Fulica americana*) on this and another lake in Arkansas. Since then, AVM has been confirmed in coots on ten lakes in four states (Arkansas, North Carolina, South Carolina, and Georgia; and also in asymptomatic birds at one reservoir in Texas. Besides coots and eagles, the disease has also occurred in several species of waterfowl, including mallards (*Anas platyrhynchos*), ringnecked ducks (*Aythya collaris*), bufflehead ducks (*Bucephala albeola)* and Canada geese (*Branta canadensis*), a great-horned owl (*Bubo virginianus*) and a killdeer (*Charadrius vociferous*).

Coots affected with AVM exhibit profound motor dysfunction and incoordination; they are reluctant to fly, ataxic on land and may swim in circles or on their backs. Histologically, the disease is characterized by diffuse, spongy degeneration throughout the white matter of the central nervous system (CNS) of affected birds. Despite extensive diagnostic and field investigations, the causative agent of AVM is still unknown. Recently, the disease was experimentally reproduced in red-tailed hawks (*Buteo jamaicensis*) upon ingestion of tissues from AVM-affected coots, providing evidence that eagles contract the disease by consuming affected coots or ducks. A subsequent experiment in which chickens (*Gallus* spp.) were fed different tissues from affected coots demonstrated that the causative agent was present in the gastrointestinal (GI) contents, but not in the brain, fat, kidney, liver or muscle of the chickens. During recent work, we demonstrated that ingestion of several samples of *Hydrilla* (but not all) from lakes with ongoing outbreaks of AVM resulted in brain lesions (in mallards) indicative of AVM. These results support the hypothesis that the causative agent of AVM is ingested by waterbirds while consuming aquatic vegetation at affected sites. At two sites with AVM, *Hydrilla* is the dominant aquatic vegetation; however, it is not present in all AVM-affected lakes.

Although we don't have definitive data, we suspect the disease is associated with other aquatic vegetation that is dominant in other affected lakes. Based on results of our previous work with sentinel mallards and coots at WL that demonstrated that the exposure to AVM is site-specific and seasonal, we hypothesize the agent is either seasonally accumulated by aquatic vegetation, such as *Hydrilla*, or seasonally produced by one or more organisms associated with aquatic vegetation at affected sites. Also, upon ingestion of some *Hydrilla* samples collected during an AVM outbreak, several coots in our studies became sick and died with neurologic signs similar to those seen in wild birds, but lacking the characteristic brain lesions of AVM. We are currently in the process of conducting a site characterization of lakes with AVM in comparison with paired control lakes and additional animal trials to determine the etiologic agent.

Prairie dogs (*Cynomys* sp.) and their most dependent predator, the endangered black-footed ferret (BFF) (*Mustela nigripes*) are highly susceptible to sylvatic plague (*Yersinia pestis*) and have experienced significant declines in the last century, in part due to this disease. Prairie dogs are also significant reservoirs of plague for humans in the western United States. We have been conducting studies to determine if protective immunity against plague could be induced in black-tailed prairie dogs (*C. ludovicianus*) by voluntary consumption of a novel plague vaccine and in BFF's by inoculation.

A recombinant raccoon poxvirus that expresses the F1 antigen of *Y. pestis* (designated RCN-F1) was incorporated into a palatable gela-

tin-based carrier bait and offered to 18 fasted prairie dogs for voluntary consumption; 18 negative control animals received placebo baits. Baits were given to prairie dogs at weeks 1 and 4, and at week 7, all animals were challenged with virulent *Y. pestis*. Survival rates differed significantly between the two groups ($P<0.01$); 10 of 18 (55.6%) vaccinates survived compared to two of 17 (11.8%) negative controls. Serum IgG antibody titers against *Y. pestis* F1 antigen increased significantly between baseline and post-prime samples ($P<0.01$) and between post-prime and post-boost samples ($P<0.02$) in the vaccinated animals. The results of this study suggest that a protective immune response to *Y. pestis* infection can be elicited through voluntary consumption of palatable baits laden with the RCN-F1 vaccine. This strategy may prove useful in controlling plague epizootics in free-ranging prairie dog colonies.

The BFF depends primarily on prairie dogs for both food and shelter and thus may be exposed to the bacteria either by consumption of plague-infected prey or by fleabite. Once thought to be extinct, a captive breeding and recovery program was established for the BFF in 1987 after an outbreak of canine distemper nearly decimated the last known wild colony that was discovered 6 years earlier. The occurrence of plague in prairie dog populations and its potentially devastating effect on BFF re-establishment is a major impediment to the captive breeding and recovery program of this federally listed endangered species. We conducted further experiments to assess the feasibility of vaccinating the BFF against plague using a recombinant fusion protein consisting of F1 and V antigens from *Y. pestis.* On days 0 and 28, post-reproductive BFF's were immunized with the fusion protein by subcutaneous (s.c.) injection. Control animals received a placebo by the same route. Two weeks after the second immunization, mean antibody titers to *Y. pestis* F1 antigen were measured and found to be significantly higher in vaccinates than their pre-immunization value ($P<0.001$) and significantly higher than the control value ($P < 0.001$). Six months post-immunization, 16 vaccinates and 8 controls were challenged with approximately 8,000 colony forming units (cfu) of virulent *Y. pestis* by s.c. injection. Eleven of 16 vaccinates survived challenge with no ill effects; their survival rate was significantly different (P=0.02) from the eight control animals, all of which died within 3-6 days. Two months later, the 11 surviving vaccinates were challenged again by ingestion of a plague-infected mouse. None of the animals showed any ill effects and all survived. In contrast, seven control animals fed infected mice died of plague within 2-4 days, including one animal that did not actually ingest the mouse, but likely sniffed or licked it. This study demonstrates that immunization of BFF's with the recombinant F1-V fusion protein can induce significant antibody responses and reduce their susceptibility to plague infection. Until other methods of

plague control are developed, the F1-V vaccine might be useful in protecting black-footed ferrets in captive-breeding facilities and animals intended for reintroduction programs. Based on these results, this year we are immunizing groups of captive-reared BFF's with F1-V at the National Black-footed Ferret Conservation Center. Vaccinated animals and an equal number of unvaccinated animals will be released in several states (Colorado, Arizona and Montana) this fall to determine if vaccination improves survival. Regarding chronic wasting disease, risk analysis tools have been successfully used to determine the potential hazard associated with disease introductions and have facilitated management decisions designed to limit the potential for disease introduction. CWD poses significant challenges for resource managers due to an incomplete understanding of disease etiology and epidemiology and the complexity of management and political jurisdictions. Tools designed specifically to assess the risk of CWD introduction would be of great value to policy makers in areas where CWD has not yet been detected.

To this end, the USGS created a steering committee representing states, native communities, federal, academic, and non-governmental entities. This committee formulated a collaborative process for the development of CWD risk assessment tools applicable to both free-ranging and captive populations. The committee recommended a workshop be held on the topic and suggested the format, content, and potential participants. Identified objectives of the workshop included:

- Identify and discuss the needs of various government and non-government groups involved with assessing, managing, and/or preventing CWD;
- Identify current gaps in CWD research specifically in relation to information applicable to the risk analysis process; and
- Construct a general, consensual, framework model that incorporates all factors identified as potentially associated with the presence or absence of CWD.

The resulting CWD Risk Analysis Workshop was held May 11-13, 2004 in Fort Collins, Colorado. It was attended by 28 individuals who represented a cross-section of management, research, and non-government organizations. Experts with experience in a variety of risk analysis approaches and representatives from public and private user groups, presented in the plenary session. The remainder of the workshop consisted of facilitated breakout sessions and all-group discussions.

A summary report of the Workshop has been produced, reviewed by the participants and is available upon request. It contains summaries of speaker presentations, group discussions, a list of identified risk factors, and the framework model. Further funding for this project is

not available. Nevertheless, we will try to work with existing resources to create additional products that will make limited risk analysis information tools available for managers.

Production of a prototype for the CWD Data Clearinghouse (CWDDC) began in March, 2004 as a collaborative project of the National Biological Information Infrastructure (NBII), the NBII Wildlife Disease Information Node (WDIN), and the USGS-NWHC. Following initial development, the Nebraska Game and Parks Commission, the Tennessee Wildlife Resources Agency, and the Wisconsin Department of Natural Resources joined the partnership, contributing a subset of their existing CWD data for testing purposes. The Maryland Department of Natural Resources offered their support as a test bed for the data entry process. When the prototype became functional, partner representatives, as well as those from USDA, USGS and non-governmental organizations, were invited to participate in multiple on-line "virtual workshops", to demonstrate the system, and offer feedback for improvements. Following the workshops, all participants were given the opportunity to trial the CWDDC at their own desks. These comments were then reviewed and changes were made to the prototype. This second version of the prototype will be demonstrated during the 2004 IAFWA meeting, and be available for testing and comments. Additional comments will be reviewed and incorporated before a working system is made available. The CWDDC will continually be modified to ensure that it meets agency needs.

A CWD-positive tissue bank is being developed in order to collect and maintain significant amounts of CWD-positive tissues and make them available for valid research projects as reference materials. Twelve elk, 12 mule deer and 12 white-tailed deer have been captured and transferred to Sybille Wildlife Facility in Wyoming. All 36 will be orally inoculated with CWD in the near future. Animals will be serially harvested and tissues collected at approximately 6, 12 and 18 months post-inoculation. This will provide a time series of tissues that may provide useful for testing various existing and new assays. Collaborators on this project include Wyoming Game and Fish Department, University of Wyoming, and the NWHC.

Another research project will identify and monitor strains of CWD in wild and captive cervids and establish a strain identification assay for CWD. Preliminary results indicate that a western blot fingerprinting technique may be useful for identifying specific CWD strains. Collaborators for this project are Dr. Richard Bessen at Montana State University and Dr. Tonie Rocke at the NWHC.

A CWD biomarker research project is being conducted to identify biomarkers indicative of CWD infection in cervids. Evidence of infection has been noted in the pituitary glands of (intracerebrally) scrapie–infected rodents. This result suggests that endocrine hormones are

promising biomarkers that may be useful for detecting CWD before the onset of clinical disease. Collaborators are Montana State University.

Effective disease detection in free-ranging cervids presents some unique statistical challenges. It is impossible to obtain a statistically random sample from free-ranging wildlife. Therefore, standard theory used for human and domestic disease detection cannot be applied. Computer simulation techniques are being utilized to design more effective surveillance designs for wildlife. Collaborators include the Iowa State Cooperative Fish and Wildlife Research Unit.

A variety of small mammals scavenge deer carcasses and could therefore potentially come in contact with infectious material. It is critical to understand whether CWD can jump the species barrier and become established in other wildlife species. We are initiating challenge studies in the NWHC isolation facility to examine whether small rodents can contract CWD and whether CWD can adapt to a rodent host.

The 2nd International CWD Conference will be held July 12-14, 2005 at the Monona Terrace Conference Center in Madison, Wisconsin. Wisconsin Department of Natural Resources is the primary sponsor, with assistance from USGS-NWHC and USDA-APHIS. Program planning is in early stages.

National West Nile Virus (WNV) Update: 2004

Dr. Daniel Mead, Southeastern Cooperative Wildlife Disease Study (SCWDS), briefly updated the Committee on the status of WNV in the United States. First identified in the U.S. in 1999, the mosquito-borne virus has been detected in every state except for Alaska and Hawaii. Mead stated that since 1999, the virus has been detected in over 275 avian, 22 mammalian, and 1 reptilian species.

Dr. Mead briefed the Committee on nationwide 2003 and 2004 bird, human and equine surveillance results. Mead stated that ~73,861 dead birds were reported to officials in 2003. According to Mead, WNV was detected in 11,597 of those dead birds. During 2004, WNV has been detected in 6,014 wild birds. During 2003, 9,389 human cases were reported from 41 states. This year, 1,951 human cases, including 184 blood donors, have been reported from 40 states. During 2003, 4,494 equine cases were reported. This year there have only been 951 equine cases reported.

Dr. Mead also updated the committee on a variety of WNV research projects continuing or recently completed at the SCWDS and the University of Georgia's College of Veterinary Medicine. Projects included research into the role of peridomestic avian species in WNV epidemiology, detection and reporting rates of surrogate dead crows (decoys) placed in the environment under urban and rural condition, and envi-

ronmental persistence of uninfected crow and sparrow carcasses placed in the environment and monitored with trail cameras to observe scavengers visiting the sites.

WNV Infection in Sage Grouse

Dr. Todd Cornish, Wyoming State Veterinary Diagnostic Laboratory, provided a report on WNV infection in sage grouse. The greater sage grouse (*Centrocercus urophasianus*) is a declining species native to sagebrush habitats of western North America. Historically widespread, the species has disappeared from much of its original range, with an estimated total population decline of 45-80% and local declines of 17-92%. Loss and degradation of nesting and brood-rearing habitat from human change is thought to be the single most important factor leading to fragmentation, reduction, and extirpation of populations. These changes have led to several petitions to list sage grouse under the Endangered Species Act, and also increase the risks to sage-grouse populations from other factors, including diseases like West Nile virus WNV.

In the summers of 2003 and 2004, WNV was diagnosed as the cause of mortality for 32 free-ranging sage-grouse from Wyoming and Montana and 5 free-ranging grouse from Alberta. At necropsy, significant gross lesions were not observed in most birds. Consistent microscopic lesions included acute necrosis in many organs, including spleen, kidney, heart, and adrenal gland, without significant inflammation. West Nile virus infection was confirmed by real time reverse transcriptase polymerase chain reaction (RT-PCR)120 and immunohistochemistry in all birds, and by virus isolation in select birds.

End of year survivorship data collected in 2003 from three marked populations of sage-grouse in Wyoming and Montana indicate that WNV infection was responsible for a 25% decrease in annual survivorship of adult hens in each of these populations. Lek count data collected in 2004 further demonstrate significant proportional decreases in sage-grouse populations at sites where WNV was confirmed as a cause of mortality in 2003, with several lek populations experiencing local extirpations. Serological surveys performed on birds from several marked populations of sage-grouse in Wyoming and Montana and on marked birds from Alberta and hunter-killed birds from areas in Wyoming that experienced WNV sage-grouse mortalities demonstrated that 0/300 birds had serum-neutralizing antibodies against WNV.

In spring of 2004 an experimental trial was performed at the University of Wyoming to determine the outcome of experimental WNV infection in greater sage-grouse. Forty adult birds were captured, acclimated to captivity, and tested for serum-neutralizing antibodies to WNV. All birds were negative for such antibodies, were divided into treatment groups, and dosed with 10^2, 10^4, or 10^6 plaque forming units (PFU) of

a 2003 WY sage-grouse isolate of WNV subcutaneously. A fourth treatment group consisted of birds directly exposed to inoculated birds (in-contact controls) with a final negative control group. All inoculated birds died or required euthanasia by day 7, regardless of dose, and 40% of contact birds also were infected and died. Clinical signs were observed up to 12 hours before death, including depression, anorexia, ataxia, fine tremors of the head and neck, recumbency, and inability to walk or fly. Virus was isolated from most tissues and samples examined, and demonstrated in most tissues and samples by immunohistochemistry and real time RT-PCR, including oral and cloacal swabs in 100% of inoculated birds. Birds were viremic from day 2 through termination of the trials (up to day 7), with an average viral titer of 10^8 PFU/ml.

In contrast to most other species in the order Galliformes, sage-grouse appear to be quite susceptible to fatal infection with WNV. Natural infections appear to be causing localized population declines and possible localized population extirpations and experimental infections and serological survey data suggest that WNV causes very high mortality in greater sage-grouse, with no evidence of survival in the lab or the field following infection. Further surveillance and field/laboratory studies are required to assess the range-wide significance of this emerging disease on greater sage-grouse populations, and to address management and recovery plans for this species of concern.

Highly Pathogenic Avian Influenza Viruses and Wild Birds

Dr. David Stallknecht, the Southeastern Cooperative Wildlife Disease Study, reported on highly pathogenic avian influenza (HPAI) viruses and wild birds. Outbreaks of HPAI virus (H5N1) were reported this past winter among domestic poultry in Cambodia, China, Indonesia, Japan, Laos, South Korea, Thailand, and Vietnam. The virus has been responsible for 43 confirmed human cases, including 31 deaths. In June and July 2004, H5N1 activity was reported in domestic poultry in China, Thailand, and Vietnam indicating new outbreaks or continuation of the winter events. Additionally, investigators have found that the H5N1 virus apparently is widespread among domestic ducks in southern China. The World Health Organization has expressed concern about the threat the virus poses to human health.

Reports of HPAI mortality in wild birds were associated with the winter outbreaks raising questions related to the possible role of wild birds in the maintenance or transmission of the virus. Although some wild bird mortality has been attributed to the H5N1 virus, currently there is no direct evidence to support a role for wild birds in the epidemiology of this virus. However, two events during the last two years suggest that we should keep an open mind. The most recent event was the isolation of an H5N1 virus from a peregrine falcon found dead in Hong Kong during January 2004. The other event occurred during the win-

ter of 2002-2003, with confirmed outbreaks of H5N1 HPAI in two waterfowl parks in Hong Kong. During these outbreaks, mortality was documented in captive wild ducks and greater flamingos and in free-flying gray herons and a black-headed gull.

It is well established that wild birds represent the reservoir for avian influenza viruses (AIV) worldwide; however, there are no reports of direct transmission of any AIV from wild birds to humans. A wide variety of AIV has been isolated from numerous species in the orders Anseriformes (ducks, geese, and swans) and Charadriiformes (shorebirds, gulls, and terns). These isolates have included all of the currently known AIV hemagglutinin (H) and neuraminidase (N) subtypes that are used to classify these viruses. AIV is transmitted within these wild populations through a fecal/oral route via cloacal shedding of virus and contaminated water. Infection rates in wild birds are dependent on season, location, age, and species. In North American ducks, for example, high infection rates (which can exceed 30%) are primarily associated with juvenile mallards during pre-migration staging in late summer, when birds are migrating from northern breeding areas. With shorebirds, consistent isolations of AIV have been reported only from ruddy turnstones during spring migration stopovers at Delaware Bay. In short, the epidemiology of these viruses in wild birds is complex and dependent on behavior as well as species susceptibility to infection.

AIV diversity within these wild populations also presents a complex picture with regard to subtype and virulence. Subtype diversity in wild bird populations does not occur randomly. In duck populations in North America, for example, H3, H4, and H6 subtypes represent the majority of isolates, and this has been a consistent finding for more than 30 years. The H5 and H7 AIV subtypes have been isolated from wild birds, but they are uncommon and, with a single exception, have been nonpathogenic viruses. HPAI H5 and H7 viruses from wild birds are extremely rare. Of the thousands of viruses isolated from wild birds worldwide, only one previously had been associated with either domestic or wild bird mortality. This virus, an H5N3, the first AIV reported from a wild bird species, caused mortality in common terns in South Africa in 1961. The origin of this virus remains unknown and there is no evidence that it persisted in any wild bird population following this single outbreak.

There are some unique observations associated with the Hong Kong waterfowl park outbreaks that deserve attention. At these waterfowl parks, mortality attributable to a HPAI virus (H5N1) was reported from numerous species of ducks and geese. Although captive, these species represent a group of wild birds (ducks and geese) that have not been previously associated with clinical disease or mortality attributable to AIV infection. In addition, HPAI mortality was documented in captive flamingos and from several free-living birds, including gray

herons and a black-headed gull. This is not the first time that an AIV has been isolated from gray herons or black-headed gulls, but, as with ducks, it is the first time that mortality was associated with infection.

With influenza the basic rule is "never say never." The current H5N1 HPAI outbreaks in domestic poultry in Southeast Asia, the zoonotic potential of this virus, reports of wild and zoo bird mortality associated with this virus, and previous reports of wild bird mortality associated with a closely related H5N1 virus in Hong Kong certainly deserve attention. Mortality associated with the HPAI outbreaks in the Hong Kong waterfowl parks indicates that some H5N1 HPAI viruses may be pathogenic to some wild bird species. However, these results provide little insight into either transmission or maintenance of HPAI in wild bird populations or transmission between wild and domestic avian populations. These unfolding events dramatically underscore the need to better understand the epidemiology of AIV in our wild bird populations and to identify mechanisms for both interspecies transmission and the emergence of HPAI viruses.

Wyoming Elk Die off at Red Rim

Dr. Terry Kreeger, Wyoming Game and Fish Department, reported on a large mortality event involving elk. In February and March 2004, 304 cases of elk (*Cervus elaphus*) paresis were confirmed in the Red Rim habitat area southwest of Rawlins, Wyoming. Elk were found in sternal recumbency, they were alert and reactive, but unable to rise. Several cases progressed to lateral recumbency, lack of response and eventual death. Some elk provided food and water did not progress but did not improve either. The majority of cases were euthanized for humane reasons. On gross necropsy elk were in fair to good body condition; some elk had subcutaneous hemorrhage. A few cases exhibited pale streaking of the muscles, particularly the semimembranosus, semitendinosus, and gastrocnemius muscles.

Thirty-eight potential causes of paresis were ruled out. During field investigations, large quantities of ground lichen (*Xanthoparmelia chlorochroa*) were noticed. This lichen was also found in the rumen contents of several elk. Approximately 50 kg of the lichen was gathered and fed to captive elk. Three elk were given a mixed diet of lichen and alfalfa for 3 days, then lichen only for 7 days, and then back to lichen and alfalfa for 2 days at which time the experiment was ended. On day 10, one elk went down in sternal recumbency and was unable to rise. On day 13, a second elk went down in a similar manner. Both elk were euthanized and necropsied. Gross and microscopic lesions were consistent with lesions from the elk affected in the field. The cause of mortality was attributed to the consumption of lichen. The third elk showed no signs of toxicity, but it was unknown how much, if any, of the lichen it consumed. Interestingly, several other domestic and wild

species were also in the area of the die-off, had access to the lichen, but were not affected. The toxic compound of the lichen has not yet been identified, though literature suggests that it may be usnic acid. In the future, the lichen will be analyzed for toxic compounds and the diets of other herbivores will be examined to determine if they ate the lichen.

Bovine Tuberculosis in Michigan Deer

Dr. Stephen Schmitt, Michigan Department of Natural Resources, reported during the year 2003, surveillance activities for *M. bovis* continued statewide. In white-tailed deer, 32 animals cultured positive from 17,301 deer submitted for testing. Since 1995, a total of almost 123,869 deer statewide have been tested and 481 have tested positive. Apparent prevalence in the core area of the outbreak was 1.7% in 2003. Since surveillance began in 1995, prevalence in both yearlings and all adult deer tested from the core area has undergone a statistically significant ($p= 0.05$ yearlings; $p= 0.001$, all adults combined) downward trend. In the remainder of the five county area of northeast Michigan where TB is most prevalent, apparent prevalence was 0.2%. Prevalence continues to be highest in older bucks. Of 481 positive deer found since 1994, 67% have come from only 8 townships, suggesting foci of relatively higher prevalence surrounded by broad areas of much lower prevalence. To date, 1,513 non-cervids of 16 species have been cultured for the disease; 42 have been positive. Eighteen of those have been coyotes. Gross lesions have been extremely rare in non-cervids, and none of the positives has shown extensive pathology. Since 1996, 1,290 elk have been tested for TB. The first positive elk was found in 2000, at the eastern edge of the elk range, near the core outbreak area in deer. Since then, three more elk have tested positive. DNA analyses of isolates from infected animals of all species continue to implicate a single strain of *M. bovis*.

Strategies for eradication of TB from Michigan wildlife focus on 1) reducing deer population densities and 2) reducing man-made aggregations of deer by restriction or elimination of baiting and recreational feeding. These strategies have been implemented through provision of extra rifle seasons and unlimited antlerless permits in the former case and by banning or restriction of deer baiting and feeding in the latter. In the five county area most affected by TB, deer numbers have declined by approximately 38% since 1995, but persistent focal areas of high density, particularly on private land, remain problematic. Since 1999, baiting and feeding have been prohibited in seven counties, where TB has been found in deer. Compliance with restrictions has been uneven, and enforcement continues to pose a challenge, though the overall scope of baiting and feeding has declined substantially since 1997.

The Michigan Department of Natural Resources (MDNR) Wildlife Disease Laboratory is sharing a $58 million, 152,500 square foot facility with the College of Veterinary Medicine's Diagnostic Center for Population and Animal Health (DCPAH) which consolidates activities from five separate locations on the Michigan State University (MSU) campus, on the agricultural campus of MSU in East Lansing. DCPAH occupies 90% of the building and the MDNR's Wildlife Disease Lab 10%. Recognized as leaders in wildlife disease, the MDNR Wildlife Disease Lab had started at MSU (then Michigan State Agriculture College) in 1934. By 1957, wildlife disease problems outgrew the original facility, and the MDNR Lab moved to a facility at the Rose Lake Wildlife Research Center. In August 2004, the MDNR Lab has come full circle and is back at MSU.

To better understand the biology of bovine TB, efforts are underway to:

- Determine the routes of transmission of bovine TB between wildlife and domestic animals;
- Determine which wild animals are capable of being infected with and transmitting bovine TB;
- Develop new diagnostic strategies and techniques;
- Determine what influences the spread of bovine TB in wildlife; and
- What determines how the disease is manifested in wildlife.

To better understand the impact of bovine TB on farm families, communities and society efforts are underway to:

- See the program from the perspective of farm families;
- Determine how various stakeholder groups respond to and are affected by the bovine TB situation in MI;
- Establish the factors influencing public perceptions and behaviors which would enhance efforts to manage associated issues and conflicts;
- Document the economic impact of the bovine TB situation in MI of private property values; and
- Observe the attitudes, behavior and efforts of hunters in areas of MI where bovine TB has been found.

To understand the distribution and determinants of bovine TB within populations efforts are underway to:

- Monitor the occurrence of bovine TB in wild cervids;
- Monitor the occurrence of bovine TB in wild carnivores and omnivores; and
- Conduct risk analyzes related to bovine TB.

To determine if bovine TB can be diagnosed by a single blood test,

Study	Investigators	Year
Economic consequences associated with bovine TB in Northeastern Michigan	Leefers, Ferris, Probst	1997
Economic consequences of bovine TB for Michigan livestock agriculture –	Wolf & Ferris	2000
Valuing losses from depopulating dairy herds	Wolf, Harsh and Lloyd	2000
Dairy farm decisions on how to proceed in the face of TB	Wolf & Nott	2000
Deer behavior at fall baiting and winter feeding sites	Winterstein, Muzo, Garner, Campa	
Bovine tuberculosis: the perspective of farm families	Griffore & Phenice	2000
A statewide survey of bovine TB knowledge and attitudes	Griffore & Phenice	2002
Extension directors views of bovine t uberculosis	Griffore, Phenice, Walker, Carolan	2002
Factors associated with bovine TB on cattle farms	Kaneene, Bruning Fann, Granger, Miller, Porter-Spalding, O'Brien	2002
Geographic analysis of bovine TB in free-ranging white-tailed deer	Miller, Kaneene, Schmitt, Lusch, Fitzgerald	
Dynamics of Bovine TB in Wild White-tailed deer in Michigan	Hickling	2002
Ecological correlates with TB hotspots	Winterstein & Hughey	

instead of the comparative cervical test, which requires that cattle be handled twice (injection and reading) studies examining gamma interferon are also being conducted.

Completed studies include:

In addition, studies are ongoing to:

- Develop a farm-level biosecurity model;
- Incorporate epidemiology and spatial aspects into a state level risk analysis;
- Understand attitudes, behavior, and effort of hunters in bovine TB areas of Michigan;
- Survey hunter preferences for deer herd size;
- Understand deer migration and movement patterns before and after baiting and feeding ban;
- Determine harvest efficiency of hunting over bait –vs- non-bait hunting;
- Examine the relatedness among TB positive deer compared to the rest of the population;
- Understand white-tailed deer population characteristics and landscape use patterns in southwestern Lower Michigan;
- Examine the efficacy of deer repellents derived from plant species; and
- Examine the effect of Johne's disease status on the reliability of caudal fold TB test

Other Discussions

Dr. Tracy Lynn, USDA-APHIS-VS, briefly reported on the development of a new national surveillance system for zoonotic diseases and intentions to involve the wildlife disease community in this effort.

Ms. Phyllis Mendon of the National Deer Farmers Association discussed her desire to form a CWD Working Group and invited interested persons to provide contact information to her.

A draft resolution was introduced that proposed federal regulation of movement of tissues from deer and elk carcasses to prevent introduction of CWD to new areas. The draft resolution was withdrawn following lengthy committee discussion.

The Committee approved one resolution and forwarded it to the Committee on Nominations and Resolutions for approval by the general membership. The resolution addressed a request for the involvement of state wildlife management agencies in coordination and implementation of activities described in Homeland Security Presidential Directive 9.