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## SCWDS BRIEFS: Volume 18, Number 4 (January 2003)

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# SCWDS BRIEFS

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A Quarterly Newsletter from the  
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## The Latest on CWD

The news regarding chronic wasting disease (CWD) keeps coming in, and there have been many developments since the October 2002 update in the SCWDS BRIEFS (Vol. 18, No. 3). Increased surveillance has detected additional infected animals among free-ranging and captive cervids. Federal assistance has become available for CWD testing, and the U.S. Food and Drug Administration (FDA) has issued recommendations regarding the rendering of deer and elk carcasses.

**Wisconsin** – CWD has been detected for the first time in an animal that escaped from a captive cervid herd. The white-tailed deer escaped from a Walworth County herd in March 2002 in southeastern Wisconsin and ran loose in the wild until it was killed and tested on October 22, 2002. The deer was shot as part of stepped-up surveillance in the vicinity, following the discovery of a CWD-positive doe in the captive herd on October 16. Four more herdmates tested positive when the remaining 118 captive deer were killed and tested in December 2002. This infected facility is approximately 80-100 miles east of Wisconsin's CWD eradication zone and about 20-30 miles north of an Illinois location where CWD recently was found in wild deer (see Illinois report below).

Additional infected wild white-tailed deer have been found in Wisconsin, bringing the total number of positive animals to 55. Five positive whitetails were killed by hunters west of the 411-square mile CWD eradication zone but

within the state's CWD management zone where deer populations are being reduced to help control spread of the disease. The Wisconsin Department of Natural Resources does not plan to alter its CWD management program, including the size of the eradication zone, until more local and statewide testing is completed. Results from 9,064 of 38,396 wild deer samples collected across Wisconsin indicate a 2.2% infection level within the eradication zone, 0.1% prevalence within the management zone (all west of the eradication zone), and no positive animals outside of these zones. The escaped captive deer that tested positive in Walworth County is not included in the wild deer surveillance data. As of late January, 114 of 124 wild white-tailed deer sampled in Walworth County had been tested with no positives found; the remaining results are pending. Additional information can be found at [www.dnr.state.wi.us/](http://www.dnr.state.wi.us/)

**Illinois** – On November 1, 2002, the Illinois Department of Natural Resources (IDNR) announced that CWD had been found for the first time in a sick wild white-tailed deer euthanized near Roscoe in Boone County along the Wisconsin border. Since then, six additional infected deer have been detected through the IDNR's surveillance of hunter-harvested deer, which was planned prior to discovery of the first positive animal. All seven infected animals were from the northern tier counties of Boone, McHenry, and Winnebago. Although these counties border Wisconsin, there have been no positive deer found between the CWD management zone and the positive Illinois deer.

As of January 3, 2003, CWD test results were available from more than 2,300 of about 4,000 samples collected in 36 Illinois counties. The IDNR is conducting additional surveillance where positive deer have been found in order to obtain information necessary to develop management plans. Additional information can be found at [www.dnr.state.il.us/](http://www.dnr.state.il.us/)

**Colorado** – CWD infected mule deer and elk have been found outside the established CWD-endemic area within northeastern Colorado and southeastern Wyoming. Extensive surveillance in Colorado this autumn and winter has detected 233 CWD-positive animals among 24,684 deer and elk tested to date, with results pending from approximately 1,300 more animals. Among the positives are 55 mule deer and elk outside the historic endemic area. Most of the positive animals originated north of I-70 in the western half of the state; however, one infected mule deer was identified east of Grand Junction, and six positive mule deer were found just south of Denver. Additional information can be found at [www.wildlife.state.co.us/](http://www.wildlife.state.co.us/)

**Wyoming** – In Wyoming, enhanced surveillance of hunter-killed deer and elk has detected 47 positive animals, including six mule deer from areas where CWD previously had not been found. The new positive animals originated from the western slope of the Snowy Range south of Saratoga, the western slope of the Sierra Madres, and just northwest of Casper. As of mid-January, testing had been completed on more than 1,400 of almost 2,300 samples collected statewide. Additional information can be found at <http://gf.state.wy.us/>

**Nebraska, South Dakota, and Saskatchewan** – The Nebraska Game and Parks Department announced in January 2003 that seven additional CWD-infected wild deer had been discovered through the state's expanded surveillance program. Fortunately, all positive animals were found in the Panhandle where a total of 22 wild deer have tested positive over the last 2 years. The small number of positive animals suggests a low prevalence of the

disease, and the lack of positive findings outside this area is encouraging. Additional information can be found at Nebraska Game and Parks Commission's website at [www.ngpc.state.ne.us/](http://www.ngpc.state.ne.us/)

Two additional infected animals have been found in South Dakota this autumn, bringing the total number of infected wild deer and elk found in the state to three. One of the new positives was a road-killed white-tailed deer within the city limits of Rapid City and the other was a sick elk in Wind Cave National Park. All three positive animals were found in the southwestern part of the state. Additional information can be found at South Dakota Game Fish and Parks Department's website at [www.state.sd.us/gfp/](http://www.state.sd.us/gfp/)

Three positive wild mule deer have been detected this past fall in western Saskatchewan, bringing to six the number of infected wild deer found in the province. One of the three new cases originated near Saskatchewan Landing Provincial Park. The other two came from the same area in the Manito Sandhills south of Lloydminster where CWD previously had been found in three wild deer. Additional information can be found at [www.serm.gov.sk.ca/](http://www.serm.gov.sk.ca/)

**United States – National developments** – Funding to implement the *Plan for Assisting States, Federal Agencies, and Tribes in Managing CWD in Wild and Captive Cervids* remains elusive. However, the U.S. Department of the Interior and the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) have made funds available for CWD testing at USDA-affiliated laboratories. The International Association of Fish and Wildlife Agencies has contacted all state wildlife agencies with information on obtaining Interior funds for CWD testing of wild cervids.

In order to receive funds from USDA, state surveillance programs must be approved by APHIS. However, APHIS does not require CWD surveillance of wild cervids, nor does it

require states to conduct APHIS-approved programs if they carry out surveillance without USDA assistance. USDA funds also are available for testing privately owned captive deer and elk. To be considered for funds for CWD surveillance of free-ranging cervids, wildlife agencies should submit surveillance strategies for evaluation by APHIS through the Area-Veterinarian-in-Charge in their state.

In November 2002, the U.S. Food and Drug Administration (FDA) announced that "the Agency will not permit material from CWD-positive animals or animals at high risk for CWD, to be used as an ingredient in feed for any animal species." Animals considered to be at high risk for CWD would "include animals from CWD-positive captive herds, free-ranging animals from the endemic area in Colorado and Wyoming, deer from the eradication zone in Wisconsin, and deer from any areas designated around new foci of CWD infection that might be identified through surveillance...." The FDA is developing a Question and Answer document as well as a CWD Compliance Guide and invites public comments ([www.fda.gov/cvm](http://www.fda.gov/cvm)).

Nationally, an estimated 225,000 free-ranging deer and elk will be tested for CWD during the fall and winter of 2002-2003. This tremendous volume has laboratories running at full capacity, and results of many tests are pending. (Prepared by John Fischer)

### **TWS Reviews Wild Ungulate Confinement**

The Wildlife Society (TWS) recently published a technical review and draft position statement on the confinement of wild ungulates within fenced enclosures. The review was prepared by a group of six professionals in wildlife management and wildlife health and is titled "Biological and Social Issues Related to Confinement of Wild Ungulates."

Biological issues addressed by the review include behavioral impacts on confined animals, diseases associated with confinement and shipping, genetic impacts of confinement and

transport from natural ranges, and impacts on habitat and non-target species inside and outside of the fence. Social issues covered by the review include cultural and legal issues of public versus private ownership of wildlife resources, hunter ethics, public perception of hunting, commercialization and domestication of wild animals, and ecological stewardship.

The Wildlife Society's draft position statement was based on the technical review of wild ungulate confinement. Position statements are published as TWS policy following comments by TWS members, revision, and approval by TWS Council. The draft statement accompanying the current review recognized that "use of high fences may have specific and legitimate uses in wildlife management and research, but it also carries the potential for significant adverse impacts" and identified the following TWS policies with respect to ungulate confinement:

1. Encourage anyone confining ungulates to thoroughly analyze, understand, and minimize potential adverse impacts to native species.
2. Oppose private ownership of wildlife.
3. Support state wildlife agencies as the sole regulatory authority over native North American ungulates, including those confined by high fences.
4. Encourage management of all confined ungulates at natural carrying capacity to minimize potential for inbreeding, diseases, habitat degradation, and non-target species impacts.
5. Encourage state and federal wildlife agencies to collaborate on funding and developing systems for monitoring diseases in confined and free-ranging native and exotic ungulates.
6. Support a moratorium on the construction of confinement facilities that require importation or exportation of native North American ungulates and the shipment of live North American cervids.
7. Support regulations and inspections that prevent escape and facilitate recovery of

escaped animals from ungulate enclosures.

8. Oppose the use of funds generated from traditional (sportsmen's) sources for confined ungulate inspections and regulatory programs, unless most sportsmen derive benefits from them.
9. Oppose high-fenced enclosures, regardless of size, if they exclude free-ranging native ungulates from critical seasonal habitats or migration routes.

Increasing demand for selling and hunting live wild ungulates and their products, along with a growth in captive wildlife facilities, prompted this thorough review of wild ungulate management behind high fences. Concerns regarding potential dissemination of diseases, particularly chronic wasting disease, have increased dramatically within recent years, most notably resulting in more stringent regulation of confined live cervids and their movements. However, health matters comprise just one small facet of the complex issues surrounding high fences and privatization of wildlife. All of these issues are addressed in the technical review and are designed to guide policy and management of fenced properties. Copies of the review, *Technical Review 02-3*, can be obtained from TWS at 5410 Grosvenor Lane, Suite 200, Bethesda, MD 20814 or [www.wildlife.org](http://www.wildlife.org) (Prepared by John Fischer)

### **Exotic Newcastle Disease Outbreak**

Exotic Newcastle disease (END) was confirmed in backyard poultry flocks in southern California on October 1, 2002. In response, the California Department of Food and Agriculture and USDA's Animal and Plant Health Inspection Service (APHIS) activated emergency response systems and began an eradication campaign. The outbreak appeared to be contained in backyard flocks in California, but on December 18, 2002, sick birds were found at a commercial egg layer facility in California and on January 16, 2003, in a backyard flock in Las Vegas, Nevada. As of January 15, 2003, there were 1,220 positive and

contact premises in California. By this date, approximately 678,466 birds had been depopulated on 830 premises, with 390 premises waiting to be depopulated. The infected premises include four commercial flocks. Counties with positive flocks in California are Los Angeles, Riverside, San Bernardino, San Diego, and Ventura. The Governor of California has declared a State of Emergency, and the California State Veterinarian has quarantined an eight-county area in southern California. The quarantine regulates movement of poultry and poultry products and includes chickens, doves, ducks, geese, grouse, guinea fowl, partridges, peacocks, pheasants, pigeons, quail, ratites, swans, and turkeys. Clark County and parts of Nye County in Nevada also are now quarantined, but there are no commercial poultry flocks in Nevada. In addition, APHIS has imposed federal quarantines that regulate interstate movement of all species of birds and poultry products from the affected areas, and the USDA has declared an Extraordinary Emergency in California and Nevada in order to provide additional resources and authorizations to the eradication campaign.

Newcastle disease (ND) viruses belong to the family Paramyxoviridae. Nine avian paramyxoviruses have been identified, and ND virus is the prototype virus for Type 1 avian paramyxoviruses. Newcastle disease viruses occur as three pathotypes, lentogenic, mesogenic, and velogenic, which reflect increasing degrees of virulence. The virus involved in the current outbreak is highly pathogenic, i.e., velogenic, and is foreign to the United States.

Clinical END is most severe in chickens, guinea fowl, peacocks, pheasants, pigeons, and quail, while severity in passerines and psittacines is variable. Mortality in unvaccinated commercial chickens infected by END virus can approach 100%, and mortality in vaccinated chickens may be 10-20%. Transmission among commercial poultry is via contact with infected birds, fecal material, or

aerosol over a short distance or indirectly via contact with contaminated people, vehicles, and equipment.

The last major outbreak of END virus in commercial poultry in the United States occurred in southern California during 1971-1973. A total of 1,341 infected poultry flocks were identified, and about 12 million birds were destroyed at a cost of \$56 million. Wild bird surveillance was conducted by the Southeastern Cooperative Wildlife Disease Study and APHIS during the 1971-73 outbreak to determine if wild birds were a source of spread. In all, 9,446 wild birds representing 71 species were sampled. Of these, four birds (0.04%) were infected. These four included one crow that was observed eating cracked eggs at an infected premises and three house sparrows caught in poultry houses with infected poultry or in recently depopulated poultry houses. Imported pet birds were found to be the source of the END virus in this previous outbreak.

Other types of ND virus are found worldwide, and at least 236 species of wild birds have been found infected. In addition, an ND virus distinctly different from the current END virus caused mortality in double-crested cormorants in a series of outbreaks in Canada and the United States during the 1990s. The impacts these viruses have on wild bird populations are not known.

The presence of END in southern California poultry is a serious threat to the commercial poultry industry of California and the United States. Impacts range from the loss of infected flocks in southern California to loss of domestic and international trade for California and the United States. Currently, many countries, including Canada, China, and Mexico, have banned import of all poultry and poultry products from California, while the European Union has banned import of all live poultry, ratites, and farmed or wild game birds and fresh meat and hatching eggs from these birds from the entire United States. Additional information is available at the following web sites:

[www.cdffa.ca.gov/ahfss/ah/Newcastle\\_info.htm](http://www.cdffa.ca.gov/ahfss/ah/Newcastle_info.htm) and [www.aphis.usda.gov/lpa/issues/enc/exoticnc.html](http://www.aphis.usda.gov/lpa/issues/enc/exoticnc.html) (Prepared by Joe Corn)

### **Southern Tick-Associated Rash Illness (STARI)**

In the northeastern United States, *Borrelia burgdorferi*, the causative agent of Lyme disease, is maintained in nature through a cycle involving the white-footed mouse and other rodents as primary reservoir hosts and the black-legged tick, *Ixodes scapularis*, as vector. Although white-tailed deer mount an antibody response following infection, they appear unable to infect ticks with *B. burgdorferi*, thus, they do not serve as a reservoir host. The primary role of deer is serving as a major host for vector tick populations.

Lyme disease occurs much less commonly in the southeastern and south-central United States than it does in the northeastern United States. However, a Lyme disease-like illness that develops in humans following bites by lone star ticks, *Amblyomma americanum*, has been described. Individuals affected with this illness, termed “southern tick-associated rash illness” (STARI), commonly develop a localized expanding circular skin rash at the site of the tick bite similar to that seen with classic Lyme disease. A mild illness characterized by generalized fatigue, headache, stiff neck, and, occasionally, fever accompanies the rash. The disease appears to respond to antibiotic treatment.

STARI, which also is referred to as “Masters’ disease” in recognition of the physician who first described its clinical presentation, has been attributed to infection with a yet-uncultivated spirochete, tentatively referred to as *Borellia lonestari*. Cases consistent with STARI have been reported from several southeastern and south-central states, including Georgia, Maryland, Missouri, North Carolina, and South Carolina. The majority of patients with STARI do not have laboratory evidence of infection with *B. burgdorferi*.

Because the etiologic agent has not yet been isolated in culture, PCR amplification of DNA has been used to identify the presence of *B. lonestari* in humans and ticks. DNA evidence of *B. lonestari* has been found in wild-caught *A. americanum* ticks from Alabama, New Jersey, Tennessee, and Texas, as well as in a tick removed from an affected person who had traveled to Maryland and North Carolina. Despite widespread documentation in ticks, a vertebrate reservoir host of this organism has not been identified. White-tailed deer are preferred hosts for larvae, nymphs, and adults of *A. americanum*. Because of their intimate association with lone star ticks and because of their important role in the natural history of *Ehrlichia chaffeensis*, which also is vectored by lone star ticks, the status of white-tailed deer as potential hosts for *B. lonestari* was assessed by SCWDS and other researchers at the University of Georgia.

Frozen serum samples from 80 white-tailed deer from 17 populations in 8 southeastern states where deer were known to be parasitized by lone star ticks were selected from the SCWDS serum bank and tested. DNA evidence of *B. lonestari* infection was found in 7 of the 80 deer (8.7%) tested from a total of 5 of the 17 sites (29.4%). Positive animals were detected from Arkansas, Georgia, North Carolina, and South Carolina. Analysis of the nucleotide sequences of the DNA products from each of the seven positive deer samples revealed 100% identity with *B. lonestari* sequences.

The DNA sequences amplified from deer blood were identical to those amplified from lone star ticks described as harboring *B. lonestari* and also are identical to the single sequence reported from a human patient exhibiting evidence of STARI. Although other animals may be infected with this organism, this is the first report of evidence of *B. lonestari* in a vertebrate other than a human.

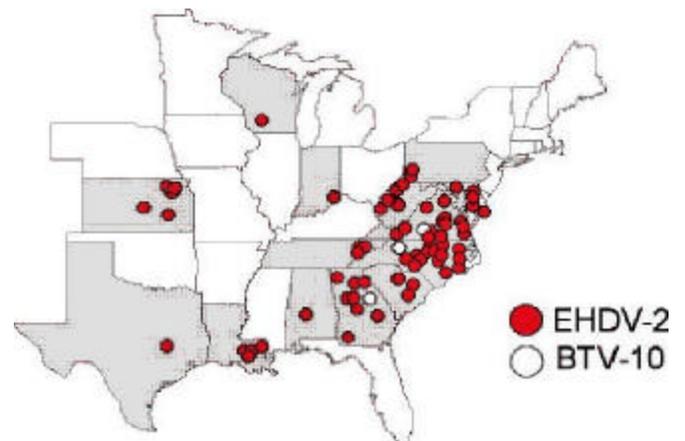
The results of this study suggest white-tailed deer also are naturally infected with *B. lonestari*, but the actual role of deer as a

reservoir host is uncertain. Additional studies are needed to verify infection in deer and transmission of *B. lonestari* by ticks. Details of this work are available in Moore et al., 2002, *Journal of Clinical Microbiology* 41: 424-427. (Prepared by Susan Little and Gus Moore).

### Record Year for HD

White-tailed deer tissue samples submitted to SCWDS for bluetongue (BT) and epizootic hemorrhagic disease (EHD) virus isolation reached record proportions this year due to a major outbreak of hemorrhagic disease (HD) that extended from Georgia to Pennsylvania. A total of 203 submissions were received, from which 99 isolates of EHDV-2 and 3 isolates of BTV-10 were made. Our earliest virus isolation (EHDV-2) came from a white-tailed deer submitted from Virginia on August 14, 2002. The last isolation (also EHDV-2) came from a deer submitted from Kansas on November 5, 2002. In all, virus isolations were made from deer from more than 60 counties in 14 states (Figure 1).

Figure 1: Virus isolations by location, 2002



The spatial distribution of EHDV-2 during 2002 exhibited a slight expansion from the typical range of HD as determined from data collected since 1981 through SCWDS's annual questionnaire. The known distribution of HD in white-tailed deer corresponds very closely to the reported range of the biting midge *Culicoides sonorensis*, a recognized vector for both the

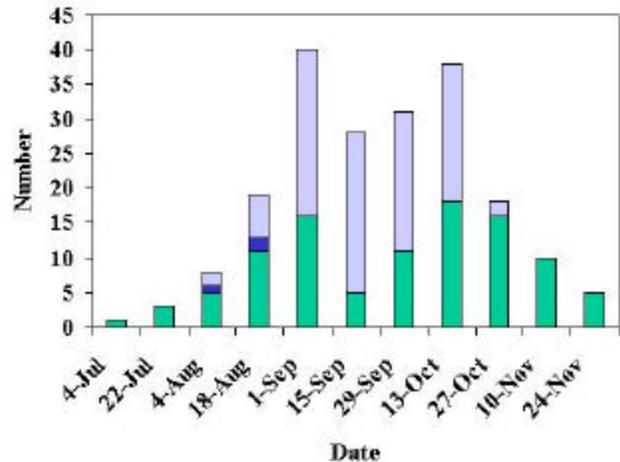
BT and EHD viruses. Confirmation of EHDV-2 in Wisconsin and Pennsylvania in 2002 represents the first time that an EHD virus has been isolated from deer in these states. During the fall of 2002, EHDV-2 also was identified from white-tailed deer in Ohio by USDA's National Veterinary Services Laboratories, USDA, in Ames, Iowa. These new records represent only a slight expansion of the reported range and may reflect a recent climatic variation that proved favorable to vector population dynamics. It also is possible that these isolations were influenced by increased emphasis on deer surveillance associated with chronic wasting disease (CWD), as the Wisconsin HD activity occurred within the known CWD-infected area of that state.

It is important to note that most of the virus isolations that we have made from white-tailed deer since 1989 have been identified as either EHDV-1 or EHDV-2. Thus, from both our serologic and virus isolation data, these appear to be the predominant serotypes associated with HD in the eastern United States. Since 1989, all of our isolations from white-tailed deer in the northern or central eastern United States (Delaware, Indiana, Kentucky, Maryland, New Jersey, and West Virginia) have been identified as either EHDV-1 or EHDV-2, with no BT viruses isolated. This is significant because BT can represent an important restraint to international livestock trade. To date, our data from white-tailed deer in no way suggest a northern expansion for the BT viruses. In fact, all of our BTV isolations from deer since 1989 (including this year) have been associated with southeastern states well within the recognized range for these viruses.

The temporal distribution of HD during 2002 followed seasonal patterns observed in previous years (Figure 2). Our earliest and latest virus isolations from 1989 to present were from deer submitted on July 19 and November 17, respectively. The peak in clinical submissions and virus isolations during September and extending into late October and early November is consistent with our previous records dating

back to 1980. The detection of BTV-10 for 2 consecutive weeks from Piedmont sites in three States and the subsequent disappearance of this virus in September are interesting and cannot be explained at this time.

Figure 2: Virus isolations by date, 2002



Regional HD outbreaks in the eastern United States are not uncommon and seem to occur in 8- to 10-year cycles. However, the last large-scale outbreak that was seen in the currently affected region occurred just 3 years ago in 1999 and involved both EHDV-1 and EHDV-2. The factors behind these outbreaks are poorly defined but probably represent the combined effects of herd susceptibility (both innate and acquired immunity) and local or regional climatic conditions affecting vector abundance and range. This year, as has been reported in the past, HD occurred in an area of intense drought, which is consistent with environmental conditions that would enhance *Culicoides sonorensis* breeding sites. Verification of such a relationship, however, will require analysis of long-term data sets to measure variation in host susceptibility as well as climate. A more complete understanding of other potentially competent *Culicoides* vectors that may be regionally important also may prove relevant, especially in understanding why the EHD viruses predominate in the eastern United States. (Prepared by David Stallknecht)

## **Renal Coccidiosis Agent Investigated**

From 1984 to 2001, more than 1,200 double-crested cormorants (*Phalacrocorax auritus*) are known to have died of renal coccidiosis during 10 mortality events in Georgia, Iowa, Kansas, Minnesota, Nebraska, and South Carolina. These diagnoses were made by SCWDS and the National Wildlife Health Center; however, the specific identification of the species of *Eimeria* was not determined in these die-offs. In December 2001, an outbreak of renal coccidiosis in double-crested cormorants from Skidaway Island, Georgia, afforded SCWDS an opportunity to further study this disease and identify the causative protozoan. The parasite was described and named *Eimeria auritusi* in an article authored by SCWDS researchers and published in the December 2002 issue of *The Journal of Parasitology* 86(6): 1230-1233. Renal coccidia are protozoan parasites of the kidney of a variety of birds, amphibians, and mammals. Most renal coccidia belong to either of two genera, *Eimeria* or *Klossiella*. Although these parasites are relatively common, their biology is not completely known. This is largely due to problems with getting the organisms to develop (sporulate) in the laboratory, consequently, few detailed studies have been directed to them. In previous studies, researchers were unsuccessful in getting the coccidia to sporulate, therefore a formal identification was not made. Sporulation is the maturation of the parasite to the infective form, which is necessary to distinguish different species. Specimens often were submitted to diagnostic laboratories either frozen or refrigerated to prevent degradation of the sample, but cold temperatures stunt the development of the parasite, which made sporulation highly unlikely.

The gross lesions associated with *E. auritusi* were similar to those described for other renal coccidia and included greatly enlarged kidneys containing small-to-large white or cream-colored nodules. These nodules contained large numbers of coccidia organisms and were readily visible microscopically. Microscopic findings

varied with the severity of infection and ranged from minimal damage to extensive distention of renal tubules. Extensive pathology often has been associated with outbreaks; however, some individuals may have light infections, which results in limited observable pathology or few clinical signs. The causes of outbreaks are unknown but may be related to crowding and stress. Outbreaks frequently occur in late winter.

To date, nine species of renal *Eimeria* have been described from aquatic birds (penguins, puffins, herring gulls, black-headed gulls, domestic geese, mallards, common eiders, swans, and common loons). Unsporulated and undescribed oocysts have been observed in numerous other species of waterfowl. Although the species that infect cormorants and geese have been associated with outbreaks, many of the other species of renal coccidia cause little or no mortality. SCWDS is interested in additional research on coccidia that infect the kidneys of birds, especially their phylogenetic relationship to other coccidia and pathology. Additional samples are needed for this work. If you are interested in submitting samples, or for additional information, please contact Michael Yabsley (myabsley@vet.uga.edu). (Prepared by Michael Yabsley)

## **2001 Survey of Wildlife Related Activities**

The results of the *2001 National Survey of Fishing, Hunting, and Wildlife Associated Recreation* recently were released by the U.S. Fish and Wildlife Service. The survey is conducted at 5-year intervals and compares trends in both the number of United States citizens who participate in these activities, as well as information on expenditures, demographics, and miscellaneous activities linked with fishing, hunting, and other wildlife-associated activities. The survey is the only source of comprehensive information on participation and expenditures that can be compared on a state-by-state basis and provides estimates on the economic importance of wildlife-related recreation for each state.

Results show that during 2001, a total of 82 million U.S. residents 16 years old and older (37% of the U.S. population) fished (34.1 million), hunted (13.0 million), and/or participated in some other sort of wildlife-related activity (66.1 million). The estimated expenditures for 2001 for the various wildlife-related activities included \$35.6 billion for fishing, \$20.6 billion for hunting, \$13.8 billion for items used for fishing and hunting, and \$38.4 billion for wildlife viewing activities. This total of \$108.4 billion for all wildlife-related activities represents approximately 1.1% of the United States' 2001 gross domestic product (GDP).

The number of hunters decreased by 7% in 2001 as compared to 1991 and 1996, accompanied by a small, but not statistically significant, decrease in spending. In addition to buying basic equipment such as guns, hunters also spent tens of millions of dollars on boats, binoculars, camping equipment, clothing, food, licenses, lodging, transportation, and numerous miscellaneous expenses such as guide fees and land use fees.

As in all previous surveys, wildlife viewing recreation was far more popular in the United States in 2001 than hunting or fishing but did not result in substantially more money being spent. Wildlife viewing recreation includes

wildlife feeding, wildlife watching, photography trips, nature walks, commercial photography, and cinematography. In 2001, participation increased 5% from 1996 but decreased 13% from 1991. Wildlife watchers spent most of their money on equipment such as binoculars, backpacking equipment, camping equipment, food, and off-road vehicles but also spent considerable money on travel expenses. The activities most enjoyed by wildlife watching participants in 2001 were observing and photographing wildlife, followed by feeding wild birds or other wildlife and visiting public parks and areas.

Dr. Steve Williams, Director of the U.S. Fish and Wildlife Service, summed up wildlife values to U.S. citizens very well in his opening paragraph of the Foreword as follows: "Fish and wildlife resources are part of our American culture. Whether we are fishing, hunting, watching wildlife or feeding backyard birds, Americans derive many hours of enjoyment from wildlife-related recreation. Wildlife recreation is the cornerstone of our Nation's great conservation ethic."

The full text of the 170-page *2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation* can be accessed at [www.census.gov/prod/2002pubs/FHW01.pdf](http://www.census.gov/prod/2002pubs/FHW01.pdf) (Prepared by Rick Gerhold)

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