
SCWDS BRIEFS

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H5N1 Influenza Virus in Wild Birds: A Fact Sheet

Since our article "HPAI in Wild Birds" in 2004 (SCWDS BRIEFS Vol. 19, No. 4), highly pathogenic avian influenza (HPAI) virus H5N1 continues to be found in wild birds in Asia. Many of these events probably were associated with spillover of virus from infected domestic birds or carcasses. In recent mortality events primarily involving swans and gulls, a changing pattern is emerging: it appears that this virus may be moving with migrating wild birds through Asia and into eastern Europe. Outbreaks in wild birds that have been supported by virus isolations of HPAI H5N1 have occurred in western China, Mongolia, Russia, and, most recently, Croatia. Although this is a disturbing situation in terms of potential wildlife impacts and viral spread to domestic birds, our understanding of the epidemiology of HPAI H5N1 is incomplete.

Epidemiological factors related to species susceptibility, virus shedding, and environmental persistence of virus may enhance transmission in wild bird populations. However, little information is available to evaluate the potential for HPAI H5N1 to be maintained in wild bird populations in North America or to evaluate risks associated with specific taxonomic groups or species. SCWDS currently is working to provide some of this information through experimental inoculation and environmental persistence studies with HPAI H5N1 (see "SCWDS Avian Influenza Studies Funded," SCWDS BRIEFS, Vol. 21, No. 1).

The involvement of wild birds with HPAI H5N1 in Asia has resulted in elevated concerns for

the introduction of this virus into North America and potential risks associated with the handling of wild birds, especially ducks. To address these concerns, and to provide biologists with a working knowledge of avian influenza terminology and the potential risks as they currently exist in North America, the following fact sheet was prepared to share our current understanding of the HPAI H5N1 situation in wild birds. This will be updated as necessary and will be available on our website (www.scwds.org).

Highly Pathogenic Avian Influenza Virus H5N1 and Wild Birds

What are avian influenza viruses?

- Avian influenza viruses (AIV) are Type A influenza viruses that are associated with avian species. They have been isolated from more than 100 species of free-living birds world-wide.
- Classification of these viruses is based on their hemagglutinin (H) and neuraminidase (N) subtypes. There currently are 16 H and 9 N recognized subtypes, and all of these subtypes are represented in viruses isolated from wild birds.
- Wild birds represent the historic source for Type A influenza viruses affecting both domestic bird and mammalian species.
- The host adaptation that occurs after the movement of these viruses from wild birds to domestic animals to humans often results in the evolution of "new" viruses, which can become adapted to the new host population. These "new" viruses (which include the human Type A influenza viruses) differ from the original viruses found in wild birds and are no longer associated with wild avian populations.

- The movement and adaptation of Type A influenza viruses from wild birds to new host species (especially mammals) is not a common event, which is evident from the limited number of human type A influenza viruses.

What is a Highly Pathogenic Avian Influenza virus?

- Highly pathogenic avian influenza viruses are influenza viruses that cause high mortality in domestic poultry.
- Highly pathogenic avian influenza viruses are associated with the H5 and H7 subtypes.
- ***Not all H5 and H7 subtypes are highly pathogenic.***

What is “Bird Flu” and what is “HPAI H5N1”?

- ***“Bird Flu”*** is a nonscientific term that was coined to describe the HPAI H5N1 viruses that have been present in Asia since 1997. This term has caused a great deal of confusion because it is often used as a synonym for avian influenza.
- ***HPAI H5N1*** is a highly pathogenic H5N1 virus that has persisted in Asia at least since 1997. It is established in domestic poultry populations in Asia (primarily chickens and domestic ducks).
- In 1997, a human death resulting from ***HPAI H5N1*** virus infection in Hong Kong was reported; there have been over 100 human cases with approximately 60 fatalities since that time. All human cases have occurred in Asia, and almost all of these cases have been linked to direct contact with infected poultry.
- In 2002/2003, wild bird mortality in Hong Kong was attributed to infection with ***HPAI H5N1*** virus. Wild bird mortality associated with ***HPAI H5N1*** has continued through 2005, and the current distribution ***suggests*** movement of this virus via migratory birds.

What do we know about avian influenza viruses in wild birds?

- Our knowledge regarding the epidemiology of avian influenza in wild birds is extensive but not complete.
- Most AIVs have been isolated from birds that are associated with water, with most isolations originating from species in the Anseriformes (ducks, geese, and swans) and Charadriiformes (gulls, terns, and shorebirds).
- In ducks, the prevalence of AIV peaks in late summer and early fall. Outside of this period, infection rates often are lower than 1%.
- In gulls and shorebirds, peak infection rates are associated with spring migration, but these rates differ greatly between species and generally are low.
- These temporal patterns result in consistent spatial patterns. For example, avian influenza viruses can be isolated from ducks on wintering grounds, but the prevalence of infection is very low.
- Viruses recovered from wild birds include all of the H and N subtypes, but these subtypes are not equally represented. In North America, viruses representing the H5 and H7 subtypes are present, but these are not HPAI viruses and are not common.
- ***None of these naturally occurring North American AIVs from wild birds have been associated with mortality or morbidity in any wild bird species.***
- Prior to 2002/2003, when the HPAI H5N1 was linked to wild bird deaths in Asia, there was only one historic case of wild bird mortality associated with AIV infection (an H5N3 in South Africa in the 1960s caused mortality in common terns). This HPAI virus may have originated from infected poultry flocks, and it did not persist in wild bird populations.

- Thousands of influenza isolates have been made from ducks and other birds in North America during the last 30 years. Despite this ongoing surveillance, ***there is no indication that any HPAI viruses exist in North American wild bird populations.***

Do we have HPAI H5N1 in North America?

- ***There is no evidence to suggest that an HPAI H5N1 virus is present anywhere in North America.***

Is there currently a public health risk associated with HPAI H5N1 in wild birds?

- ***In the United States there currently is no recognized public health risk associated with wild bird contact.***
- All human deaths associated with bird-to-human transmission of avian influenza viruses have occurred in Asia, and all have involved the HPAI H5N1 viruses. Human cases in Asia have occurred in connection with extensive infections in domestic poultry.
- Other H5, H7, and H9 avian influenza viruses have been transmitted directly from infected domestic birds to humans. These events have involved HPAI and low pathogenic avian influenza (LPAI) viruses, but all have involved contact with infected poultry.
- ***There has never been a single documented case of avian influenza virus transmission directly from wild birds to humans.***
- ***There is no indication that wild waterfowl species hunted in North America are infected with HPAI H5N1.***
- Although there currently is no recognized risk associated with hunting waterfowl and HPAI H5N1 in North America, basic hygiene, including hand-washing, when handling any wild animals or carcasses is always recommended, as is proper preparation and thorough cooking of food.
- With regard to pandemic influenza, the primary public health risk associated with HPAI H5N1 in Asia relates to the potential

for genetic changes (mutations within the H5N1 or recombination with human influenza viruses) that would allow for efficient human-to-human transmission. If this were to occur, transmission of this “new” virus would no longer require an avian source.

Is there a domestic animal health risk associated with HPAI in wild birds?

- Worldwide, there have been many documented cases of low pathogenic avian influenza virus transmission from wild birds to domestic birds. This is especially true for free-ranging domestic flocks that have direct contact with wild ducks.
- In the United States, there are no documented cases of HPAI transmission from wild birds to domestic birds, and it is believed that most HPAI viruses evolve after an H5 or H7 virus becomes established in domestic bird populations.
- In Asia the recent expansion in distribution of HPAI H5N1 ***suggests*** that domestic flocks are being infected with this virus through contact with migratory wild birds.

What is the possibility of HPAI H5N1 entering North America via migratory wild birds?

- Some migratory bird species move between North America and Asia and Europe, however, genetic studies of avian influenza viruses from Eurasia and North America suggest that there is very limited exchange of AIVs between continents (even with very common influenza viruses).
- It is not possible to discount the possibility of an HPAI H5N1 introduction, but such an event based on the known epidemiology of other avian influenza viruses would likely be a very low probability event.

What is the possibility of this virus being maintained in wild bird populations?

- There is limited information on which to evaluate this possibility.

- Experimental studies have demonstrated bird-to-bird transmission of HPAI H5N1 in mallards, but these studies were completed under confinement conditions that are not representative of natural conditions.
- Experimental studies with HPAI H5N1 strains have consistently demonstrated higher respiratory rather than cloacal shedding of virus. In wild birds, low pathogenic avian influenza viruses generally are associated with cloacal shedding, and transmission occurs via a fecal/oral route through contaminated water. It is not clear if the extent of fecal shedding with HPAI H5N1 is consistent with the naturally occurring AIVs that are maintained in wild bird populations.
- It is known that other AIVs can persist for extended periods of time in water. Information on environmental persistence of HPAI H5N1 in water is lacking.
- In experimental trials of mallards with HPAI H5N1, mortality and morbidity were common. Most isolates from wild birds in Asia also have been associated with sick or dead birds. It is unclear if wild birds can be infected with HPAI H5N1 and remain healthy.

Do we have surveillance for HPAI H5N1 in the United States?

- Surveillance for AIV was taking place in the United States and other North American countries prior to the emergence of HPAI H5N1.
- Wild bird surveillance will be expanded to include larger geographic areas and areas of potential introduction, such as Alaska.

Additional information on HPAI can be found at these websites:

- The Centers for Control and Prevention (www.cdc.gov/flu/avian)
- USDA-APHIS-Veterinary Services (www.aphis.usda.gov/1pa/issues/avian_influenza/index.html)

- USGS National Wildlife Health Center (www.nwhc.usgs.gov/research/avian_influenza/avian_influenza.html)

(Prepared by David Stallknecht)

CWD Update – Autumn 2005

The recognized geographic and species distribution of chronic wasting disease (CWD) has expanded since early September 2005. On September 2, 2005, the West Virginia Division of Natural Resources (WV DNR) announced that a 2.5-year-old, road-killed buck from Hampshire County in the eastern panhandle of West Virginia was positive for CWD. This finding represents the first animal that has tested positive for CWD among the 33,170 wild deer and elk that SCWDS has tested from the Southeast since October 1, 2002.

Immediately after confirmation of CWD, the WV DNR implemented its CWD Response Plan. The assessment phase of the plan involved active sampling of deer within a 5-mile radius of the index case. Within 30 days, 121 deer were sampled, and 3 additional CWD-positive deer were detected. These deer were all within 2.5 miles of the index case. Sampling of additional deer will continue throughout the upcoming hunting season. Biologists will be positioned at the state's mandatory check stations in Hampshire County and, with the hunters' permission, will collect samples for CWD surveillance from each deer submitted. Enhanced surveillance for CWD will be conducted throughout West Virginia, as well as in the nearby states of Maryland, Pennsylvania, and Virginia.

The first case of CWD in a wild deer in Canada was reported on September 2, 2005. The emaciated female mule deer was reported by a citizen in southeastern Alberta, approximately 20 miles southeast of Oyen and subsequently was collected by a Fish and Wildlife Officer from Alberta Sustainable Resources Development (SRD). After the deer was

confirmed to have the disease, 133 additional wild deer were collected in the immediate vicinity, and 2 more positive mule deer were identified. Since 1996, about 6,000 wild deer and elk have been tested for CWD in Alberta, but previously it had only been identified in 1 captive elk and 2 captive white-tailed deer. The SRD is actively promoting increased deer harvest in the area to reduce the deer herd and limit the spread of CWD.

The first case of CWD in a wild moose recently was reported by the Colorado Division of Wildlife. The positive animal was a bull killed by an archer and submitted for testing on September 12, 2005. Mandatory testing of moose for CWD was initiated in Colorado in 2003. Since 2002, 288 moose from Colorado have been tested and all were negative. It is thought that moose are not likely to be an important factor in the maintenance or transmission of the disease due to their solitary nature.

The expansion of the recognized range of CWD in the United States and Canada, as well as the finding for the first time of CWD in a moose, cause continued concern for this disease among wildlife managers, hunters, animal health officials and the captive cervid industry. Research, monitoring, and management of CWD continue to be conducted in order to better understand the disease and methods to control it.

Additional sources of information include these websites:

- West Virginia Department of Natural Resources (www.wvdnr.gov/news.shtm)
- Alberta Sustainable Resources Development (www3.gov.ab.ca/srd/fw/index.html)
- Colorado Division of Wildlife (<http://wildlife.state.co.us>)

(Prepared by Kevin Keel)

National Fish & Wildlife Health

Initiative

At its annual meeting September 12-17, 2005, the International Association of Fish and Wildlife Agencies (IAFWA) passed a resolution recommending that a state/federal task force be formed under the leadership of the IAFWA to develop a National Fish and Wildlife Health Initiative and that the task force interact with fish and wildlife agencies of Canada and Mexico to develop a North American Initiative to protect fish and wildlife health throughout the continent. In addition to passing the resolution, IAFWA adopted guiding principles for the initiative. The complete text of the guiding principles follows:

National Fish and Wildlife Health Initiative Guiding Principles

The importance of maintaining healthy populations has long been recognized by fish and wildlife managers, and several disease issues are of growing concern to fish and wildlife, animal health, and public health professionals and the public they serve. Significant diseases, such as plague, hemorrhagic disease, pasteurellosis, chronic wasting disease, botulism, West Nile virus, whirling disease, and others, have been found in wild and farmed fish or wildlife populations in North America and can have a significant impact on resources. Reservoirs of economically important diseases like bovine brucellosis and bovine tuberculosis have inadvertently become established in native wildlife and threaten livestock industries in some areas. Foreign animal diseases, such as foot and mouth disease, which was eradicated decades ago, and highly pathogenic avian influenza, which never has been reported in North American wildlife, also are of concern. The intentional or accidental introduction of these diseases could significantly impact wildlife, domestic animal, or human populations and would require a coordinated multi-agency response. In view of the increasing need for fish and wildlife managers to effectively address disease

issues, a National Fish and Wildlife Health Initiative will be developed under the leadership of the International Association of Fish and Wildlife Agencies (IAFWA) and in cooperation with appropriate governmental agencies and non-governmental organizations. Although national in scope, the Health Initiative will not mandate programs at the state, tribal, or local level.

The National Fish and Wildlife Health Initiative will:

Support the IAFWA vision for healthy fish and wildlife resources throughout North America managed by effective, well-funded resource agencies supported by informed and involved citizens;

Support the IAFWA mission to protect state authority and support provincial and territorial authority for wildlife conservation; promote sound and science-based resource management; and strengthen state, provincial, territorial, federal, and private cooperation in conserving fish and wildlife resources;

Recognize that free-ranging fish and wildlife and recreational activities associated with these resources have fundamental aesthetic and economic value and contribute significantly to the quality of life and the economy on a local, state, and national basis;

Recognize that as the front-line managers, state fish and wildlife agencies are responsible for managing diseases in free-ranging fish and wildlife, and several have in place much of the knowledge, personnel, equipment, and local public support to prevent, monitor, detect, and respond to disease issues;

Foster development and maintenance of additional competencies, management tools, and training in fish and wildlife health management within state fish and wildlife agencies;

Promote science-based management strategies for health issues that involve free-ranging fish and wildlife and recognize that some disease agents found in fish and wildlife

are of significance to domestic animal and human health and vice versa;

Recognize, articulate, and integrate the abilities and authorities of cooperating state, tribal, territorial, and federal agencies and other partners;

Foster collaboration, coordination, and communication among fish and wildlife health jurisdictions, as well as with animal health and public health agencies at the state and national level;

Recognize that animals and disease agents do not observe political boundaries necessitating interstate and international coordination of health management efforts;

Recognize that state fish and wildlife management agencies are a key component in local response to biosecurity and bioterrorism threats and incidents and emphasize the importance of involvement, support, training, and planning for key agency personnel;

Recognize fish and wildlife health management as an essential component of any fish and wildlife conservation program and emphasize the importance and efficacy of prevention, as opposed to control or eradication efforts, as a strategy for managing diseases in free-ranging fish and wildlife; and

Recognize the need to develop and disseminate science-based information to educate the public about the significance of diseases in fish and wildlife populations and the value of integrated prevention and management programs. (Prepared with information from a press release from IAFWA)

EEE in Michigan Deer

Eastern Equine Encephalitis (EEE) virus was isolated from seven white-tailed deer in southwestern Michigan during September 2005; five from Kent County, one from Montcalm County, and one from Ionia County. The seven deer were thin and exhibited neurological signs (staggering), drooling, and

loss of fear of humans. These clinical signs also are suggestive of chronic wasting disease (CWD), but all seven deer tested negative for CWD. In addition, three cases of EEE and one case of West Nile virus (WNV) were diagnosed in horses in Kent County. The last human case of EEE in Michigan was in 2002.

Currently, EEE has been reported in free-ranging white-tailed deer from two states – Georgia and Michigan; however, exposure of deer to EEE likely occurs throughout the range of the virus. Two clinical cases of EEE infection in white-tailed deer have been detected by SCWDS in Georgia, one each in July 2001 and June 2005. A serologic survey of hunter-killed deer from Georgia in 2001 showed that deer exposure was relatively common in the Piedmont and Coastal Plain regions, with a prevalence of 5-55%. Because some locations have a high prevalence of EEE exposure in deer (55%) and few clinical cases of EEE in deer are detected, it likely is rare for infected deer to develop clinical disease. However, EEE should be included as a differential diagnosis for deer exhibiting neurological signs. The public is urged not to dispatch any deer exhibiting neurological signs, because these deer must be properly euthanized to provide adequate samples for diagnostic testing. The public should notify the state wildlife management agency if sick deer are seen.

EEE virus is a member of the *Togaviridae* family, genus *Alphavirus*. The virus can cause encephalitis in humans, domestic animals (horses, swine, dogs), and wild animals (birds, deer) and is maintained in a cycle of wild bird reservoirs and mosquito vectors. *Culiseta melanura*, an ornithophilic mosquito, is the principal vector in the United States, and a wide range of bird species can serve as amplifying hosts for the virus. Natural infections are rarely pathogenic for native birds; however, mortality has been reported in glossy ibises, whooping cranes, and great blue herons. Extensive die-offs have been reported

in captive-reared exotic birds, such as chukar partridges, emus, and ostriches.

To minimize risk of exposure, hunters and field biologists should:

- not eat or handle any deer that appears sick or acts abnormally;
- avoid exposure to brain or spinal tissue when processing deer; bone out carcass and keep both head and spine intact;
- not take antlers from deer that appear sick; if antlers are removed from healthy deer, use a handsaw instead of a power saw;
- wash hands with soap and water after handling carcasses and disinfect equipment and work surfaces (1 tablespoon bleach to 1 gallon water); and
- for extra caution, rubber or latex gloves can be worn when field-dressing deer.

The general public is much more likely to develop mosquito-borne encephalitis viruses (EEE, West Nile virus, St. Louis encephalitis virus) by exposure to mosquitoes. To minimize risk of a mosquito exposure, people should:

- use approved insect repellent;
- wear protective clothing;
- avoid outdoor activity during dusk and dawn when mosquitoes are most active;
- repair or install new screens on doors and windows to exclude mosquitoes; and
- eliminate standing water used by mosquitoes as breeding grounds.

Clinical signs of EEE in humans are similar to those of other mosquito-borne encephalitis illnesses and range from mild flu-like illness to severe disease (encephalitis, coma, death). The EEE case fatality rate is 35%, which makes it one of the most pathogenic mosquito-borne diseases in the United States. Most EEE human cases are reported from Florida, Georgia, Massachusetts, and New Jersey, but cases have been reported from numerous states on the East Coast, Gulf Coast, and in the Midwest. Horses also can develop severe

disease due to EEE infection and should be vaccinated in endemic areas. There are no vaccines or therapeutic drugs for EEE in humans. (Prepared by Michael Yabsley)

Anthrax in the Dakotas & Texas

The recent occurrence of anthrax in North Dakota, South Dakota, and Texas sparked questions of potential spread to wildlife. During the past summer, more than 500 head of livestock in North Dakota and South Dakota were lost to one of the largest recorded anthrax outbreaks in U.S. history. Most of the losses were in cattle, but horses, bison, and farm-reared elk also were affected. In North Dakota, 85 ranches were quarantined. Heavy rains at the beginning of the summer, followed by hot and humid weather, are thought to have been responsible for the massive number of cases. In Texas, cases of anthrax generally are seen annually in Edwards, Kinney, Uvalde, and Val Verde counties in the southwestern portion of the state. In the past year, Sutton County, Texas, which is immediately adjacent to the northern border of Edwards County, had anthrax diagnosed in cattle and farmed deer at two ranches. Anthrax had not been reported in Sutton County in at least 20 years. Ranchers in endemic areas often fail to report cases of anthrax, but dispose of suspicious carcasses and treat for anthrax empirically. Consequently, the number of reports often underestimates the number of actual cases.

Anthrax is caused by a spore-forming, gram-positive, rod-shaped bacterium, *Bacillus anthracis*. Most infections in herbivores such as cattle, horses, sheep, and deer are acquired through grazing on contaminated pastures. Spores are resistant to heat, cold, desiccation, and many disinfectants and are thought to have the ability to persist in contaminated soil for up to 100 years. Wounds created by blood-sucking insects, castration, or dehorning also are potential routes of infection. Other mammals, such as dogs, cats, pigs and humans, also are

susceptible to anthrax, but infections are seen less commonly.

Clinical signs of anthrax can vary according to the route of initial infection and the species affected. When ingested or inhaled, as would be the case in pasture contamination, clinical signs can range from sudden death with few precipitating symptoms to fever, difficulty in breathing, trembling, staggering, excitement or depression, leading to collapse and death. In horses, signs of colic may be present. In carnivores and pigs, the face, tongue, and neck may become swollen. If exposure occurs via a break in the skin, the organism may cause a local infection characterized by initial inflammation that becomes cold and insensitive to the touch and may later necrose. Local cutaneous infections can progress into the more generalized forms described with ingestion or inhalation.

Penicillin is the treatment of choice for anthrax for acutely affected individuals but often is ineffective for those showing severe clinical signs. Relatively effective vaccines exist and often are used for cattle in outbreak situations but are not possible to use in wildlife. It is imperative that suspected cases of anthrax be reported so that ranchers in the area can have livestock vaccinated. Care must be taken when handling suspect animals and carcasses to avoid contact with bodily fluids. Carcasses of suspect animals, along with adjacent contaminated soil, should be burned or covered with lime and buried at least 6 feet deep. Other animals should be kept away from carcasses, and under no circumstances should a carcass suspected of anthrax be opened by an unqualified person because the organisms may undergo sporulation and become an infectious form for humans.

Infected deer and elk have been reported numerous times during outbreaks. In a 1963 episode in Desha County, Arkansas, 67 white-tailed deer carcasses were found and an estimated 200 to 300 deer died. An outbreak

of anthrax in Texas in 2001 involved at least three white-tailed deer, one fallow deer, two horses, and one cow, with many more deaths suspected. In the outbreak this past summer, few wildlife species were reportedly affected. According to an August news release from the North Dakota Game and Fish Department, no anthrax had been observed in any wildlife species, despite the widespread nature of the outbreak. Although there have been no reports of disease in wildlife, it is highly likely that some deaths have occurred in native species, but these individuals were not found or not reported.

With increasingly cool environmental temperatures, the number of affected animals should decrease. As with other diseases, hunters should hesitate to take seemingly sick animals, take precautions when dressing all animals, and always cook meat well before consuming. The number of cases of anthrax that can be expected in subsequent years is impossible to predict. It can be assumed, however, that areas where anthrax was seen this year will be at risk for recurrent outbreaks due to the environmental resistance of anthrax spores. (Prepared by Dodd Sledge)

IAFWA Recognition for SCWDS

Dr. John Fischer, Director of SCWDS, has received this year's Special Recognition Award from the International Association of Fish and Wildlife Agencies (IAFWA). The award is presented each year to an individual who has distinguished himself or herself through outstanding commitment to wildlife management. Sometimes this is in the form of dedication to a single critical effort, but many times the award is given for a career-long history of achievement. The award was presented at the annual meeting of IAFWA, held in Nashville, Tennessee, September 11-16, 2005. This is an important and prestigious award, and the staff of SCWDS is extremely proud that John and SCWDS have been recognized.

The International Association of Fish and Wildlife Agencies was founded in 1902 and represents the government agencies responsible for North America's fish and wildlife resources. IAFWA applies expertise in science, policy, economics, and coalition-building to serve its members as a national and international voice on a broad array of wildlife and conservation issues. For more information about IAFWA and the Special Recognition Award, visit their website at www.iafwa.org. (Prepared by Gary Doster)

Randy Davidson Retiring

After a long and productive career with SCWDS, Dr. William Randolph Davidson is retiring in November 2005. Randy came to SCWDS to enter graduate school in 1971 after he received his B.S. degree in Wildlife Management from West Virginia University. Under the tutelage of Dr. Frank A. Hayes as his major professor Randy completed his M.S. degree in 1974 and his Ph.D. in 1975, both in veterinary parasitology. Like all SCWDS graduate students, Randy worked full-time while pursuing his education, and it was obvious early on that he was unusually intelligent and talented and was a diligent worker. Consequently, upon graduation he was offered a position as a Research Associate. Since 1985, Randy has been co-staffed with SCWDS and the University of Georgia's D.B. Warnell School of Forest Resources and retires as Professor, with full graduate faculty status.

Randy was the major professor for nine students for their M.S. degrees and four students for their Ph.D. degrees. He also was graduate student advisor and reading committee member for 15 students for M.S. degrees and 11 students for Ph.D. degrees. One of Randy's most valuable contributions to academia was teaching two graduate level courses on wildlife diseases to University of Georgia graduate students. Many of his former students now occupy important

administrative positions in state and federal agencies and universities throughout the country.

Randy has been a major force in the field of wildlife health and diseases for the last 30+ years and enjoys the respect and admiration of his peers throughout the world. As proof of this, among his awards and honors he was given the Distinguished Service Award from The Wildlife Disease Association in 1998. But more important to Randy has been the recognition received by his graduate students. At annual meetings of the Wildlife Disease Association, two of his graduate students have won the Best Student Presentation Award and three of his graduate students have received the Student Research Recognition Award. Also, one of his students received a Wildlife Disease Association Scholarship. One or more of his students also has received the Budd-Dunn Best Student Presentation Award from the Southeastern Society of Parasitologists; Excellence in Research by Graduate Students Award from the University of Georgia; Achievement Rewards for College Scientists (ARCS) Foundation Fellow; Norval-Young Award from the Society for Tropical Veterinary Medicine; University of Georgia Graduate School Dissertation Completion Assistantship; Class of 1958 Sidney Ewing Scholarship in Vector-Borne Parasitology; and the Alain Provost Award from the Society for Tropical Veterinary Medicine.

It would require an entire issue of the *SCWDS BRIEFS* to list all of Randy's accomplishments and contributions to his profession, his colleagues, and his graduate students during his career at SCWDS, but some of his major achievements are especially noteworthy. Although he contributed more than 100 articles to scientific journals, symposia, and meeting proceedings and authored 8 book chapters, Randy probably is best known as the senior author of two widely acclaimed books, *Diseases and Parasites of White-tailed Deer*, published in 1981, and *Field Manual of Wildlife*

Diseases in the Southeastern United States published in 1988. These books won the Outstanding Book Award from the Southeastern Section of The Wildlife Society in 1982 and 1989, respectively. As a highly skilled parasitologist, Randy described a new genus and species of tapeworm from wild turkeys (*Imparmargo baileyi*), a new species of lungworm of gray squirrels (*Dirofilariaeformis pulmoni*), a new species of abomasal nematode from white-tailed deer (*Apteragia pursglovei*), and a new species of nematode from the gizzard of wild turkeys (*Cyrnea neeli*).

Among his many public service activities, Randy served for many years as a reviewer for the *Journal of Wildlife Diseases* and served on the Editorial Board. He also has been a referee for many articles submitted to at least 11 other scientific periodicals, including the *Journal of Wildlife Management*, *Avian Diseases*, *Journal of the American Veterinary Medical Association*, and *The Wildlife Society Bulletin*.

Not all of Randy's contributions were in the office, classroom, or laboratory. He is a highly competent field biologist and researcher and provided valuable insight anytime SCWDS put a team in the field to investigate morbidity or mortality among deer or other species of wildlife. For many years he directed most of the field studies for white-tailed deer herd health evaluations throughout the Southeast. He conducted numerous wildlife disease workshops for state and federal employees throughout the region and served on several USDA task forces across the country when SCWDS was involved in determining if wildlife were involved as reservoirs or disseminators of diseases among domestic livestock and poultry. With his easygoing and laid-back demeanor, Randy always got along well with everyone he came in contact with and is well liked and respected by everyone from technicians and students to the highest level administrators. He has been a great asset to SCWDS and will be missed.

When asked what he planned to do after he retires, Randy stated, "I don't have the slightest idea." Some of us think we know, though – he's probably going to spend a lot more time fishing. Good luck, Randy. Have fun. (Prepared by Gary Doster)

Information presented in this Newsletter is not intended for citation as scientific literature. Please contact the Southeastern Cooperative Wildlife Disease Study if citable information is needed.

Information on SCWDS and recent back issues of SCWDS BRIEFS can be accessed on the internet at www.SCWDS.org. The BRIEFS are posted on the website at least 10 days before copies are available via snail mail. If you prefer to read the BRIEFS on line, just send an email to gdoster@vet.uga.edu, and you will be informed each quarter when the latest issue is available.