
SCWDS BRIEFS

A Quarterly Newsletter from the
Southeastern Cooperative Wildlife Disease Study
College of Veterinary Medicine

The University of Georgia Athens, Georgia 30602

Phone (706) 542-1741

<http://www.SCWDS.org>

Fax (706) 542-5865

Gary L. Doster, Editor

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Surveillance for Exotic Ticks on Wildlife

The Southeastern Cooperative Wildlife Disease Study (SCWDS) is conducting surveillance for exotic ticks on wildlife in the southeastern United States and Puerto Rico in cooperation with USDA-APHIS-Veterinary Services. Early detection of exotic ticks will increase the potential for eradication or control where exotic tick populations have been introduced. One species of special concern is the tropical bont tick (TBT), *Amblyomma variegatum*. This tick was introduced from Africa into the Caribbean in the 1800s, is a vector of heartwater and other diseases, and is a threat to wildlife and livestock in the Americas.

Currently, surveillance activities for the TBT and other exotic ticks are being concentrated in Florida and Puerto Rico. Methods include examination of free-ranging wildlife captured at selected survey sites, environmental sampling using tick drags, examination of animals at wildlife rehabilitation facilities, examination of hunter-killed wildlife, and collection of specimens from wildlife examined during other collaborative projects involving live-captures and mortality investigations. All ectoparasites are submitted to USDA's National Veterinary Services Laboratories (NVSL) for identification.

The Florida climate and abundance of wildlife are conducive to survival of introduced exotic ticks, and surveillance has been concentrated in the southern part of the state since the project began in August 2003. Over 1,400 free-ranging wild animals were examined from 71 sites.

Ectoparasites were collected from 511 animals, and identifications have been completed for 186 of these submissions. Environmental sampling using tick drags and/or tick traps was productive at only 3 of 24 sites. Over 270 animals were examined at wildlife rehabilitation centers during 11 sampling attempts from August 2003 to October 2004. Ectoparasites were collected from at least 75 of these animals, and identifications have been completed for 25 submissions to NVSL. Ectoparasites were recovered from 113 of 136 hunter-killed white-tailed deer and feral hogs from 3 sites. Road-killed wildlife surveillance was conducted on survey routes that totaled 2,292 miles. One hundred fifteen animals were found, but most were not suitable for examination.

Several areas in Puerto Rico have been targeted for surveillance due to the presence of feral domestic animal species. In February 2004, surveillance was conducted on Mona Island, Puerto Rico, in cooperation with the Puerto Rico Department of Natural Resources. Eighty-two animals were examined, including 6 Mona Island iguanas, 4 feral swine, 61 feral goats, and 11 feral cats. The island of Vieques, Puerto Rico, is of special concern because of its proximity to St. Croix, U.S. Virgin Islands, where the TBT is present. Large areas of Vieques are in a natural state, and potential hosts for the tropical bont tick such as feral cattle, horses, and goats are present. Over 200 mongooses have been examined on Vieques, and ticks were recovered from about 30% of them. All ticks from Puerto Rico currently are being processed.

Although ectoparasite identification has been completed for about 35% of the nearly 1,000 submissions, a few exotic lice and mites with origins in the Old World, South America, and the Caribbean have been identified. Intensive surveillance will continue at sites in Florida and Puerto Rico selected because of environmental factors, wildlife host abundance, and risk associated with pathways for introduction of ectoparasites. Surveillance will be conducted mostly by trapping free-ranging wildlife at selected sites, because this method has been the most productive for collection of ectoparasites. (Prepared by Joe Corn and Britta Hanson)

WNV in a South Carolina Deer

A free-ranging adult female white-tailed deer from South Carolina was submitted to SCWDS for diagnostic examination in August 2004. The deer was depressed, lethargic, and exhibited neurologic signs, including walking in circles and rolling its neck backward. Closer physical examination revealed flaccid paralysis of facial musculature and bilateral nasal discharge.

Gross necropsy and microscopic evaluation revealed severely inflamed areas within the brain that contained numerous fungal organisms. Culture of brain tissue for fungi yielded *Mucor* spp., a dimorphic fungus. As part of the SCWDS surveillance program for West Nile virus (WNV), brain tissue also was submitted for virus isolation and tested positive for WNV. Virus isolation attempts from liver, lung, and spleen were negative for WNV.

West Nile virus is a flavivirus that is maintained in nature in a wild bird/mosquito transmission cycle. Susceptible non-avian species are infected incidentally when mosquitoes carrying WNV feed on them. The range of susceptible animals continues to increase and is not completely defined. Since its emergence in the United States in

1999, WNV infection has been reported in 284 species of birds, 34 species of mammals, and 2 species of reptiles. While WNV antibodies previously have been detected in white-tailed deer, to our knowledge this is the first isolation of WNV from this species. The outcome of infection in incidental hosts is highly variable, ranging from absence of clinical signs to severe neurologic disease and death, but subclinical infection appears to be most common. There is species variation in susceptibility to infection and clinical signs, with significant disease occurring primarily in horses, humans, and some avian species. In addition, immune-suppressed individuals are more likely to experience clinically apparent disease.

West Nile virus infection has been found in other cervids, including reindeer and mule deer. Reindeer exhibited clinical signs (neurologic disease) that suggest greater susceptibility of this species to WNV than other cervids. West Nile virus infection also has been reported in other ruminants, including cattle, goats, and sheep; one ewe developed clinical disease.

Fungi within the genus *Mucor* are common in the environment, especially on decaying vegetation, soil, and feces. Although exposure to this fungus is common, clinical disease (mucormycosis) is rare and usually is associated with host immune-suppression, overwhelming fungal exposure, and/or other concurrent disease. When infection does occur, this fungus has a tendency to invade blood vessels and disseminate throughout the body. Sporadic infections have been reported in a variety of animals, including domestic and wild ruminants.

The neurologic signs and lesions in this case were most likely due to the severe fungal infection of the brain; however, the role WNV infection played in the pathogenesis is uncertain. Clinically apparent infection with either *Mucor* or WNV

is rare in white-tailed deer. As with most mammals, white-tailed deer are regarded as incidental hosts and likely do not contribute significantly to the maintenance or transmission of WNV. (Prepared by Justin Brown)

Persistence and Fate of Bird Carcasses

Surveillance targeting dead wild birds has played a critical role in the early detection of West Nile virus (WNV). The second phase of a SCWDS project investigating the use of dead wild birds in WNV surveillance has been completed. The objective of this phase of the study was to gain information on the persistence and fate of dead bird carcasses in differing environmental settings. These settings, urban and rural, were selected to be similar to those used in the first phase of this project on carcass detection and reporting conducted using crow decoys in DeKalb County, Georgia (see SCWDS BRIEFS, Vol. 20, No. 2).

The carcass persistence research was done in the Athens-Clarke County, Georgia, area during the months of July and September 2004. Carcasses of American crows and house sparrows were placed in urban and rural settings (with permission from land owners) and monitored daily for 6 days to see how long they remained in the environment. Motion-sensitive trail cameras were used to monitor a portion of the carcasses to obtain photographic evidence of scavengers removing birds.

Two independent trials were conducted, using a total of 96 crow carcasses and 96 sparrow carcasses. The data currently are under analysis; however, preliminary results indicate that bird carcasses disappeared more rapidly in the first 3 days of placement and that they disappear more rapidly in rural environments than urban environments. Scavengers consumed a higher proportion of sparrows than crows over the 6-day trials. The scavengers detected included coyotes, house cats, domestic dogs, gray foxes, red-tailed hawks, opossums, and raccoons.

The findings from this study will provide information useful in interpretation of dead bird surveillance data and the potential for oral exposure to WNV among both avian and mammalian scavengers. These investigations constitute the M.S. project for Marsha Ward, a Warnell School of Forest Resources student affiliated with SCWDS. (Prepared by Marsha Ward and Randy Davidson, Warnell School of Forest Resources and SCWDS)

Recent Cases of Hantavirus in West Virginia

Hantavirus cardiopulmonary syndrome (HCPS) is a rare, but deadly, disease of humans caused by several species of *Hantavirus* in the family *Bunyaviridae*. Unlike other bunyaviruses, which are arthropod-borne, hantaviruses are transmitted to humans by inhaling aerosolized virus shed in urine, droppings, or saliva of infected rodents. Symptoms in humans generally are flu-like and include fever (101-104F), headache, shortness of breath, muscle aches, chills, dizziness, abdominal pain, and joint and lower back pain. Person-to-person transmission of HCPS has not been documented in the United States. There currently is no vaccine, and medical management of cases is based on supportive therapy.

In July 2004, two cases of HCPS were diagnosed in West Virginia. The first case involved a male graduate student from Virginia Tech who was studying the impact of logging on small-mammal communities in Randolph County, West Virginia. This patient developed pneumonia and died from acute respiratory distress. The other case was diagnosed in a male who frequently stayed in a cabin in Randolph County, West Virginia. He was hospitalized but has recovered. These cases represent the second and third cases of hantavirus in West Virginia; the only other human cases in this region were nonfatal and occurred in a hiker who traveled part of the Appalachian

Trial in 1993 and in a resident of Jackson County, North Carolina, in 1995.

According to the Centers for Disease Control and Prevention (CDC), a total of 379 cases of HCPS, with a fatality rate of 36%, have been reported in the United States since the disease was first recognized in 1993. The vast majority of cases are from the Four Corners area (Arizona, Colorado, New Mexico, and Utah), where the disease was first recognized, but cases have been reported throughout the United States (see figure below). Most cases have been reported from males (62% of cases) and from people who live in rural areas (75% of cases). Although relatively rare in the United States, numerous hantavirus outbreaks and infections have been reported from Central and South American countries, including Argentina, Bolivia, Brazil, Chile, Panama, Paraguay, and Uruguay.

At least four hantaviruses cause HCPS in humans in the United States. The type of

virus involved in the recent West Virginia cases currently is being investigated. The most common etiologic agent is Sin Nombre virus which utilizes the deer mouse (*Peromyscus maniculatus*) as the primary reservoir host. The deer mouse is widespread in the United States except parts of the Southeast and usually is found in rural habitats. New York virus, which was diagnosed as the cause of two human cases in the Northeast, uses the white-footed mouse (*Peromyscus leucopus*) as a reservoir host. This rodent is widespread in the Northeast, Midwest, central states, and noncoastal regions of the Southeast. Bayou virus, detected in four human cases, uses rice rats (*Oryzomys palustris*) as a reservoir host. Rice rats are common in the Southeast. Black Creek Canal virus, detected in a single human case in Florida, uses the cotton rat (*Sigmodon hispidus*) as a host. The cotton rat ranges throughout the southern United States. Because of the seriousness of this illness and the difficulty in differentiating these rodent species, all rodents should be considered potentially infectious.

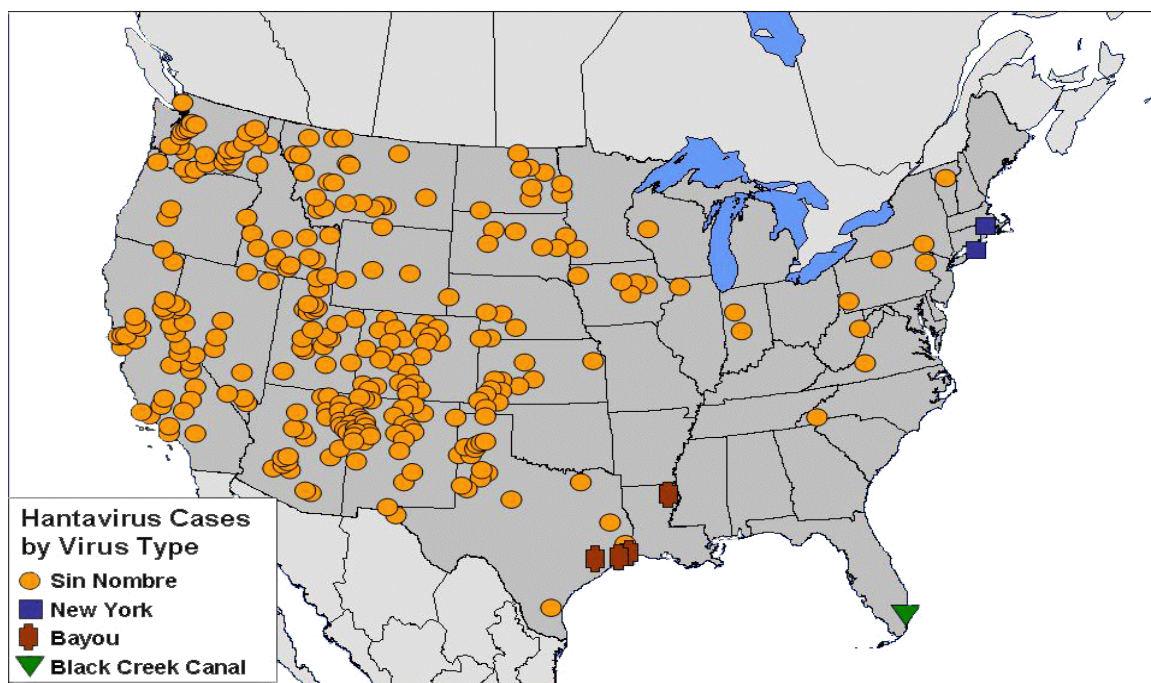


Figure. Map of human hantavirus cases by virus type (adapted from www.cdc.gov; larger color figure available at www.scwds.org).

The CDC has provided recommendations to reduce the risks of contracting hantavirus. The best precaution is to avoid contact with rodents. A partial list of precautions discussed in the report include:

- Rodent control in and around the home
- Avoid touching live or dead rodents or disturbing rodent burrows, dens, or nests
- Do not use a cabin with signs of rodent infestation until it has been ventilated for at least 30 minutes
- Do not use campsites contaminated with rodent feces
- Avoid sleeping on bare ground
- Avoid sleeping near woodpiles or garbage areas that may be frequented by rodents
- Wear proper safety equipment (gloves, mask, respirator) when working with rodents
- To avoid aerosolization when cleaning up rodent excreta, do not sweep or vacuum. The excreta should be sprayed with commercial disinfectant or chlorine solution (1 part bleach/10 parts water) until thoroughly soaked. Disinfected excreta should then be cleaned up with paper towels
- Disinfect contaminated items by using commercial disinfectant or chlorine solutions, steam-clean carpets, and launder bedding/clothing with hot water
- Items that cannot be disinfected should be exposed to sunlight for several hours or placed in a rodent-free area for at least 1 week

Additional recommendations and epidemiologic information are available in the July 26, 2002, (Vol. 51 No. RR-9) issue of the *Morbidity and Mortality Weekly Report* from CDC (cdc.gov/ncidod/diseases/hanta/hps/index.htm). (Prepared by Michael Yabsley)

Bat Rabies Update

Rabies is a fatal, zoonotic, neurological disease caused by a single-stranded RNA virus in the genus *Lyssavirus* in the family Rhabdoviridae. Experimentally, many species of warm-blooded animals are susceptible to the disease, but only mammals play an important epidemiological role. The virus replicates primarily within the tissue of the central nervous system and is passed from one host to another via a bite or introduction of saliva into a fresh wound. In developing countries, domestic and feral dogs are the major source of human rabies cases, whereas, in the United States, certain free-ranging wild mammals are the major reservoir because of extensive vaccination of domestic animals. Wild animals constituted 93% of the 7,369 cases of non-human rabies diagnosed in the United States in 2001.

Bat rabies is of particular public health concern because 90% (28/31) of the human rabies infections acquired in the United States since 1990 have been caused by rabies virus variants associated with bats. The other three human cases consisted of two cases of the dog/coyote variant of rabies in southern Texas and one case of the raccoon variant of the rabies virus in Virginia. Epidemiological investigations of human cases caused by bat variants of the rabies virus revealed that documentation of prior exposure to bats is rare. This could be a consequence of the small size of bats compared to carnivores, difficulty in recognizing that a bite has occurred, or exposure during sleep.

Presently, it is estimated that there are between 50 and 60 distinct variants of rabies virus in bats worldwide, and these variants exist in independent cycles. In 2003, a retrospective study was conducted describing trends and epidemiological features of rabies in bats in the United States. The Centers for Disease Control and Prevention (CDC) study was based on data from state laboratories from 1993 to 2000. During this time, 91,627 (11.8%) of

775,053 animals tested for rabies by state laboratories were bats, and of the bats tested, 7,097 (7.7%) were positive for rabies.

State submissions of bats varied among the regions of the United States. Most of the bat submissions originated from the Northeast, followed by the Northwest, the Southwest, and the Southeast. Bats originating from the Southwest had the highest prevalence (19.3%) of rabies, followed by specimens from the Northwest (7.0%), Southeast (6.7%), and Northeast (4.1%).

Although big brown bats (*Eptesicus fuscus*) and little brown bats (*Myotis lucifugus*) were the two species most often submitted for rabies testing, only 5.8% of big brown bats and 1.7% of little brown bats were found to be infected. The four species with the highest percentage of positive results were hoary bats (*Lasiurus cinereus*) (38.2%), Mexican free-tailed bats (*Tadarida brasiliensis*) (31.8%), eastern pipistrelle (*Pipistrellus subflavus*) (17.1%), and silver-haired bats (*Lasionycteris noctivagans*) (12.9%). Bats belonging to the three species that historically have been most commonly associated with human infection (silver-haired, eastern pipistrelle, and Mexican free-tailed bats) were grouped into a single class (LNPSTB) for comparison with other species. Bats belonging to the LNPSTB group had a 5-fold greater probability of testing positive compared to other species of bats. These results generally agreed with studies previously performed on smaller geographical scales.

These data demonstrate that bats which typically roost in solitary or small groups, including silver-haired bats and eastern pipistrelle bats, may have a slightly decreased prevalence of rabies compared to species that roost in large numbers, including Mexican free-tailed bats and hoary bats. However, it is uncertain why small colony or solitarily roosting bats are more frequently associated with human infection. Possible reasons may include lack of

effective bat enclosure devices on houses where a single bat or small group may be able to roost or lack of homeowner awareness of a small number of bats compared to a large roost. Currently, efforts are directed at developing more accurate and consistent bat surveillance programs throughout the United States in order to increase our understanding of the relationship between bat rabies and risk factors for human exposure. Any bats found dead or sick should be submitted to a diagnostic laboratory for postmortem examination and rabies testing. Common sense precautions to avoid exposure should be practiced when handling such animals. (Prepared by Rick Gerhold)

Avian Mortality at Communications Towers

The steady increase in the number of communications towers has fueled growing concerns among the scientific community and bird enthusiasts about the impact of tower-related mortalities on migratory bird populations. There are two main mechanisms for bird mortality at communications towers – collision and electrocution. The largest tower kill events almost always involve nocturnally migrating Neotropical songbirds, especially during the autumn months. The usual mechanism of such large-scale events is collision mortality. Conditions of low visibility resulting from fog and a low cloud ceiling contribute to a phenomenon wherein the water particles in the air reflect the light emitted from the towers, creating a pocket of illumination surrounding the tower. It has been hypothesized that low cloud cover may negatively affect the ability of birds to orient themselves using stellar cues or that the presence of the lighted structures may interfere with other orientation mechanisms. In any case, once the birds fly near the tower, they are reluctant to leave the illuminated area and essentially become trapped in the lighted space that surrounds the tower. As the birds congregate, flying in circles around the tower, they become

increasingly disoriented and fatigued. Eventually, many collide with the structure, the guy wires, other birds, or even the ground.

Annual avian mortality due to collisions with communications towers is now estimated to be as high as 4-5 million birds per year. Thousands of birds can be killed in just one night at a single communications tower if weather conditions are unfavorable. Tower-related deaths have been reported for 350 species of Neotropical songbirds, and mortality studies conducted in eastern North America indicate that certain families, specifically the thrushes (Muscicapidae), vireos (Vireonidae), and warblers (Parulidae), appear to be disproportionately vulnerable.

Reports of single events, short term studies, and a few long-term studies of bird kills at tower sites exist, but these studies tend to be casualty based, and data collection techniques vary. These reports verify that a large number of birds and species are affected and help to demonstrate the conditions under which kills are likely to occur but rarely allow for empirical evaluation of the behavioral aspects or characteristics of tower structure that may contribute to this type of mortality.

Various species characteristics appear to contribute to the probability of collision or electrocution. Birds traveling in flocks are suspected to be at an increased risk of collision, because birds at the back of the group may be unaware of impending obstacles. Birds of prey that roost on pylons or feed and hunt around transmission towers may be at increased risk of electrocution simply because of increased time spent negotiating the wires and also because a larger wing span increases the chance of being able to touch two wires or a wire and a grounded object simultaneously. Juveniles may also be at greater risk of collision or electrocution due to poorer flying skills.

The U.S. Fish and Wildlife Service (USFWS), which is involved in the conservation and management of migratory birds, has offered guidance to the communications industry regarding voluntary measures that may be taken to minimize the impact of tower related mortality on migrating birds. The guidelines can be found at the web address <http://migratorybirds.fws.gov/issues/towers/abcs.html>, and links to this document also can be found on several bird-related sites, including <http://www.towerkill.com>. Lighting, tower height, and number of supporting structures, which are suspected to be critical contributors to avian mortality risk, are addressed in these guidelines.

Suggestions for reducing the rate at which new towers are constructed include collocation of communications equipment on towers already in existence and the construction of new towers specifically designed to accommodate multiple users. The USFWS advises that wetlands and other areas where birds are known to concentrate should not be used as tower sites. Likewise, the USFWS suggests a review of weather conditions at a proposed site of tower construction so as to avoid areas with a high incidence of fog and low cloud ceilings. Pending further research, new applications of techniques including radar, acoustic and ground surveys may help determine major migratory routes and other critical bird use areas that can be avoided as new tower sites.

At this time more empirical studies are needed. In June 1999, the Communication Tower Working Group (CTWG) was created, and in August 1999 the first public workshop on "Avian Mortality at Communications Towers" was held at Cornell University. The CTWG includes representatives from federal and state agencies, research organizations, universities, industry representatives, and non-governmental organizations and was formed to develop a nationwide research

protocol to investigate the risk factors involved in tower collisions and evaluate possible solutions. The goals of this research include providing standardized techniques to measure the impact at a particular site and information relevant to the development of effective guidelines for reducing tower-related avian collision and electrocution mortality. (Prepared by Tina Ferrari, UGA veterinary student)

New SCWDS Faculty

We are pleased to announce that Dr. Kevin Keel and Dr. Michael Yabsley have joined our faculty as Assistant Research Scientists. Both are former SCWDS graduate students; Kevin completed his M.S. in 1993, and Michael completed his Ph.D. earlier this year. Both were exceptional students and received considerable recognition and awards during their scholastic careers.

When Kevin completed his B.S. degree in microbiology at the University of Georgia (UGA) in 1990, he entered a wildlife M.S. program at UGA's Warnell School of Forest Resources and began to work at SCWDS as a Graduate Research Assistant. Kevin completed his M.S. in 1993 and entered UGA's College of Veterinary Medicine; he continued to work part-time at SCWDS. After receiving his D.V.M. degree in 1997, he completed a 3-year residency in veterinary anatomic pathology at the University of California, Davis, then entered a Ph.D. program at the University of Arizona. In 2003 he became certified as a veterinary pathologist by the American College of Veterinary Pathology.

Michael came to us more recently from his home state of South Carolina, where he received his B.S. and M.S. degrees from Clemson University. Michael's B.S. is in Biological Sciences (1997) and his M.S. is in Zoology (2000). He started his Ph.D. program at SCWDS in 2000, and received his degree in medical microbiology and veterinary parasitology in May of this year.

We are pleased and fortunate to have these two outstanding scholars and friends with us and expect that they will add much to the quality of the overall program at SCWDS. (Prepared by Gary Doster)

More SCWDS Student Accolades

Two SCWDS graduate students were recognized and honored at the Annual Meeting of the Wildlife Disease Association (WDA) held in San Diego, California, August 28-September 3, 2004. Dr. Justin Brown received the WDA Scholarship Award, and Dr. Michael Yabsley won the Terry Amundson Award for Best Student Presentation. Justin received \$2,000 and a plaque awarded annually to an outstanding student pursuing a master's or doctoral degree in wildlife disease research. Michael won the Amundson Award for the presentation of his paper "Spatial Analysis of the Distribution of *Ehrlichia chaffeensis*, Causative Agent of Human Monocytotropic Ehrlichiosis, Across a Multistate Region." This award acknowledges outstanding oral presentation of research findings, and the winner receives \$250 and a plaque.

Vivien Dugan recently was one of five outstanding University of Georgia (UGA) doctoral candidates who received the Achievement Rewards for College Scientists Foundation Scholarship for 2004-2005 given by UGA's Biomedical and Health Sciences Institute. The \$5,000 scholarship is administered at \$2,500 per semester for two semesters. The Achievement Rewards for College Scientists Foundation, Inc., is a national volunteer women's organization dedicated to helping the best and brightest U.S. graduate and undergraduate students by providing scholarships in the natural sciences, medicine, and engineering.

Vivien also received a Dissertation Completion Assistantship for 2004-2005 from the UGA Graduate School in the amount of \$15,000. Doctoral Research Assistantships are awarded each year on a

competitive basis and are available to doctoral students in their final year of study. Receiving this award allows the student to devote time to the completion of his or her dissertation.

In a further recognition, Vivien was invited to participate in The Future Leaders Program of the Graduate School at UGA. The Program is a leadership workshop sponsored and funded by the UGA Graduate School, with the support of the Graduate School's Professional Development Advisory Board. This program is an intensive 2-day professional development workshop designed for students who are nearing completion of a terminal graduate degree in their discipline and who seek to gain or strengthen leadership capabilities.

Another student affiliated with SCWDS and conducting wildlife disease research, Marsha Ward, also received considerable recognition recently. Marsha, who is working on an M.S. degree at the Warnell School of Forest Resources (WSFR), won 1st Place for Wildlife and Fisheries Presentations at the WSFR Annual Graduate Symposium for 2004. The WSFR also awarded Marsha a \$500 Travel Grant to attend The Wildlife Society's Annual Conference held in Calgary, Alberta, Canada, September 18-24, 2004, to present her paper entitled "Detection and Reporting of American Crows in Relation to West Nile Virus Surveillance." In addition, The Wildlife Society presented her with a Travel Grant to help pay the remainder of her expenses to attend the Conference.

Heartiest congratulations to Justin, Michael, Vivien, and Marsha! We are all very proud of you. (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.

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