

Summer 2015

Special points of interest:

- **Board Elections**
- **From the Chair**
- **Student Article**
- **Risks Wild Sheep: Position**

The Vector Timeline

Fall (Vol. 9, Iss. 3)	Winter (Vol. 9, Iss. 4)
Submissions Due 2 Oct. 15	Submissions Due 2 Dec. 15
Publication Date 30 Oct. 15	Publication Date 30 Dec. 15

The editors of The Vector welcome your contributions. If you wish to submit an article, but suspect you will not quite make the deadline, please contact Samuel M. Goldstein or Kathrine Saylor.

Inside this issue:

TWS Annual Conference Announcement	1
From the Chair	1
WDWG Board Elections	1
Student Article on White Nose Syndrome	2
Communication: TWS/AAVJ Joint Statement	3
WDWG Board Nominee Biographies	6
Current Research in Wildlife Disease	11

Your WDWG membership can only be obtained by joining and renewing your annual TWS Membership each year. At the time that you join simply indicate that you want to be a member of this working group on the application. Membership dues are \$5.



The Vector

The Newsletter of The Wildlife Society
Wildlife Diseases Working Group

Excitement at the TWS Annual Conference!

The Wildlife Diseases Working Group supports workshops and multiple symposia at the annual TWS conference each year. During the 2015 Annual Conference in Winnipeg, the Working Group is supporting the following half-day symposia:

Quantitative Approaches to Wildlife Diseases (co-organizers Robin E. Russell; Evan Grant; William Kendall; David Miller; Michael Samuel; and Dan Walsh)

Highly Pathogenic Avian Influenzas in North America (co-organizers Ann Ballman, Barb Bodenstein, Bob Dusek, Thomas DeLiberto, Tom Gidlewski, Kristen Mansfield, and Colin Gillin)

Our support of these events does not involve any financial contribution; we provided endorsements and a letter of support for the 2015 symposia. Be sure to check them out!

Please feel free to attend the Working Group's Business Meeting during the annual conference (see pg. 5).

TWS WDWG Elections are Open Until October 12th

The Nominations and Elections Committee of the Wildlife Diseases Working Group (WDWG) has lined up a slate of fantastic candidates for the upcoming elections; voting will remain open until October 12th. View biographies beginning on Page 6. Please vote at the election website: <https://www.surveymonkey.com/r/L2S3ZB9>

Open positions include: Chair Elect, Secretary/Treasurer, and four(4) Board Members

Chair Elect (2 running)	Secretary/Treasurer (2 running)	Board Member (7 running; 4 positions)
----------------------------	------------------------------------	--

Message from the Chair



In a few weeks at the Wildlife Society annual meeting in Winnipeg, Manitoba, I will be transitioning to my new role as Past-Chair of The Wildlife Diseases Working Group (WDWG). I have very much enjoyed my time as Chair these last two years (and as Incoming Chair for the two years prior to that) and want to especially thank the WDWG Board for their enthusiastic support and for helping to make it a productive, interesting few years. I am looking forward to continuing to work with incoming Chair Margret

Wild to keep the momentum going and be part of the team that takes things to the next level by working to keep wildlife disease surveillance, management and research an integral part of wildlife conservation and management. I look forward to seeing many WDWG members at the upcoming TWS meeting next month. Our annual WDWG meeting will be on Tuesday October 20th from 7:30 to 9:30 am in the Delta Assiniboine B room.

Student Paper:

Bat vs. Fungus In A Race For Survival

By Michelle Verant

Articles are in-progress reports by students & young professionals. If you wish to cite this information, please contact the author directly for a personal communication or formal citation.

A 32 year-old bat hangs in balance within Maiden Rock mine, apparently untouched by the weather of time. He has seen more seasons than I, and I wonder, what will he feel, when this killer interrupts his peaceful slumber?
- Michelle Verant -

Shrouded in mystery and folklore, bats are tragically misunderstood. In reality, bats are unique and valuable insect predators with combined powers of echolocation and aerial acrobatics that make even the US Air Force jealous. And they are voracious. One little brown bat, which weighs about 7 grams, can eat about 1,000 insects an hour and up to 5,000 insects a night. This equates to about 25 billion dollars in pest control services for US agriculture.

My goal as a PhD student is to uncover clues to save these bats from a killer that looms on the horizon- a disease called white-nose syndrome (WNS) that has already claimed over 7 million lives.

In 2007, a massive die-off of bats was discovered in a New York cave: piles of tiny carcasses littered the floor and mysterious white fuzz covered the muzzles and wings of bats still clinging to the walls. These were the first victims of the killer fungus, *Pseudogymnoascus destructans*, which causes WNS in hibernating bats. This disease has since spread across eastern North America reducing populations of several bat species by over 90% and threatening some with extinction.

Before *P. destructans* arrived in North America, bats had a highly successful strategy for surviving winter. Come fall, a bat enters hibernation to conserve fat built up over summer. It slows its metabolic rate and reduces its body temperature to match the cold cave or mine. About every two weeks, the bat warms up for a brief period of activity, then returns to a cold, immobile state. These torpor-arousal cycles allow the bat to survive a long winter fast. This strategy, once the key to a bat's survival, has now become the source of its demise.

Coincidentally, *P. destructans* also thrives in cold conditions and has an affinity for bats. The



Figure 1. Little brown bat with white-nose syndrome. Areas of white fungal growth are visible on the surface of the wing membrane, which appears dull and dehydrated. Photo credit: Al Hicks, 2008, Main Graphite Mine, Warren County, NY.

fungus grows prolifically on a bat's muzzle and wings during hibernation (Figure 1). Thin fingers of fungal hyphae invade the surface of the wing membrane, destroying the protective skin barrier and the underlying connective tissues. Although this damage can inhibit the bat's ability to fly, the cascade of physiologic effects that follows is lethal. The wing membranes provide vital physiologic functions including thermoregulation, blood circulation, water balance, and gas exchange. Inhibition of these functions is thought to contribute to mortality, but is likely not the whole story.

WNS disrupts hibernation by causing a bat to arouse more frequently. Because these arousals are energetically expensive, the bat burns through its limited energy supply before spring. With no insects to eat, the bat either starves within its hibernaculum or freezes on the landscape in a desperate attempt to find food. These combined physiologic and behavioral effects are thought to be the deadly consequences of WNS. Until recently, we didn't have a mechanistic model that linked these

pathologic effects into a comprehensive understanding of why bats die from this disease.

I tackled this problem with collaborators at the US Geological Survey and the University of Aberdeen. We tested the hypothesis that WNS increases energy demands in hibernating bats using doubly labeled water, a method commonly used to measure metabolic rates in other animals, but never attempted in hibernating bats. We also measured blood chemistry to define the progression of physiologic disturbances that lead to mortality.

To test our hypothesis, we captured sixty little brown bats from a mine in Wisconsin and transported them to the USGS-National Wildlife Health Center. We infected half of the bats with *P. destructans* and half remained non-infected controls. Temperature loggers, attached to the back of each bat, recorded skin temperature and torpor-arousal patterns. Each group was placed in separate environmental incubators, which mimicked natural hibernation conditions for 98 days. Doubly labeled water was injected into each bat to estimate body composition and energy use.

We found that bats with WNS used twice as much energy as non-infected bats. Surprisingly, increased energy use was not associated with the rate or duration of arousals from torpor. Bats infected with *P. destructans* developed mild to moderate WNS based on the extent of wing lesions and did not show any differences in torpor-arousal patterns. This suggests that WNS increases metabolism in bats during early stages of infection before development of clinical signs, such as visible fungal growth and altered hibernation behavior.

Bats with WNS also had potentially life-threatening disruptions of physiology that are considered lethal in non-hibernating mammals. Infected bats demonstrated a chronic respiratory acidosis, which can inhibit vital enzyme activity and result in coma and death. It is unknown what effect this has on the physiolo-

(Continued on page 6)

Brief Communication:

**The Wildlife Society & American Association of Wildlife Veterinarians
Joint Issue Statement: Domestic Sheep and Goats Disease Transmission
Risk to Wild Sheep**



AAWV Approved March 5, 2015 (www.aawv.net)

TWS Approved March 8, 2015 (www.wildlife.org)

Bighorn sheep and thinhorn sheep (*Ovis canadensis* and *O. dalli*), collectively referred to as wild sheep, are iconic species of western North America. Found in isolated, rugged, and extreme habitats of the continent, wild sheep are vital economic, social, and ecological components of these areas.

The historic distribution of wild sheep in North America extended from Alaska to Mexico and east to the Dakotas, western Nebraska and west Texas. Population estimates of wild sheep ranged from 1.5 to 2 million at the onset of the 19th century (Seton 1909). Unregulated hunting, disease, competition for forage and space with domestic livestock, as well as habitat destruction and fragmentation led to precipitous declines in distribution and abundance through the early 1900s, with extirpations occurring in many regions (Buechner 1960). Wildlife managers have used translocations, habitat enhancement, and habitat protection to restore wild sheep populations, but recovery in some populations has been hampered by periodic disease outbreaks.

Wild sheep are susceptible to a variety of diseases that affect herd viability. The most important diseases affecting wild sheep populations are respiratory infections that result in pneumonia. Bacteria of the family Pasteurellaceae (*Pasteurella multocida*, *Mannheimia haemolytica* and *Bibersteinia trehalosi*), and *Mycoplasma ovipneumoniae* are the most frequently isolated respiratory pathogens from wild sheep with pneumonia. Pneumonia caused by these organisms often results in the mortality of a large proportion of the population (Cox and Carlson 2012) across all age classes (referred to as an all age epizootic or die-off) and is typically followed by enzootic disease with multiple years of lamb mortality from pneumonia (WAFWA WHC 2014). This pattern of pneumonia in wild sheep has been documented in more than 70 peer-reviewed scientific publications.

Incidences of pneumonia-related die-offs are frequently associated with the presence of domestic sheep and goats (George *et al.* 2008, Wehausen *et al.* 2011). Controlled research studies have confirmed that both *Mannheimia haemolytica* and *Mycoplasma ovipneumoniae* are transmitted to wild sheep upon contact with, or proximity to, domestic sheep (Besser *et al.* 2014, Lawrence *et al.* 2010, Wehausen *et al.* 2011). Domestic sheep and goats commonly carry these disease-causing organisms which typically cause few deaths and little illness in domesticated adults and lambs (Martin 1996, Gilmour and Gilmour 1989). Contact between animals from range use overlap on public land and forays of wild sheep to nearby domestic herds on private in-holdings and visa-versa, is the crux of this wild-domestic animal controversy. While not all outbreaks of pneumonia in wild sheep have confirmed contact with domestic sheep or goats, the preponderance of scientific evidence shows that association with domestic sheep and goats poses a significant threat to the continued conservation and restoration of wild sheep populations.

Management alternatives to reduce the impacts of respiratory disease on wild sheep are limited. There is currently no effective vaccine or treatment for pneumonia in bighorn sheep (Wehausen *et al.* 2011). Maintaining appropriate and reasonable spatial and temporal separation between wild sheep and domestic sheep and goats is the most effective tool currently available for minimizing risk of disease transmission between species (WAFWA WSWG 2012).

Proactively protecting and managing the health of wild sheep populations is essential to the continued success of restoration, conservation and management efforts in North America. Managers must take appropriate steps to prevent epizootic events that reduce herd health and performance. This includes taking precautions to prevent transmission of pathogens between wild sheep during relocations. Appropriate, reasonable and effective solutions will be difficult, if not impossible to achieve, until the risk of disease transmission from domestic sheep and goats to wild sheep is widely acknowledged and substantially reduced. Stakeholder groups benefit when disease risk is managed to minimize the potential transmission of pathogens.

The policy of The Wildlife Society and the American Association of Wildlife Veterinarians regarding the risk of disease transmission from domestic sheep and goats to wild sheep is to:

1. Accept that peer-reviewed, published science has consistently demonstrated the occurrence of disease transmission from domestic sheep and goats to wild sheep upon contact or proximity.
2. Recognize that disease transmission from domestic sheep and goats to wild sheep is a significant risk factor for the conservation and restoration of wild sheep populations.
3. Emphasize the need for developing and implementing disease management strategies to address chronically infected wild sheep populations.
4. Acknowledge the importance of science-based assessments of disease risk between wild sheep and domestic sheep and goats, and promote strategies to reduce the disease transmission and mitigate disease outbreaks.
5. Recognize effective temporal and spatial separation of domestic sheep and goats from wild sheep as the only currently available management solution for preventing or minimizing disease transmission and advocate for proactive and cooperative management strategies

(Continued on page 4)

(Continued from page 3)

for achieving such separation.

6. Recognize alternative management strategies are being developed, and until stakeholder agreements are negotiated, co-mingling of domestic sheep and goats with wild sheep may result in the continued loss of wild sheep from disease, and wildlife managers may have to cull infected wild sheep herds to reduce the risk of further disease transmission.
7. Recognize some wild sheep populations may harbor pathogenic organisms potentially detrimental to other wild sheep and translocation of animals can spread the pathogens they carry. Translocation of wild sheep should occur following determination that disease transmission risk is low and conservation benefits are high.
8. Emphasize the importance of monitoring herd health following relocations or disease events.
9. Promote increased cooperation and communication among all stakeholders and public education programs to articulate the risks and impacts of disease transmission between wild sheep and domestic sheep and goats.

The Wildlife Society's Position Statement on "Livestock Grazing on Rangelands in the Western U.S." supports livestock grazing management on rangelands that "guards against the potential for disease transmission between domestic livestock and wildlife" (TWS 2010).

The mission of the Wildlife Society's Wildlife Diseases Working Group is to promote better scientific understanding of the causes and consequences of disease in ecosystems and wildlife populations; to apply the principles of wildlife science, ecology, and epidemiology to the prevention and management of diseases in wildlife; to foster education and transfer of information on diseases to wildlife management professionals and the public; and to apply this knowledge to enhance the health and conservation of wildlife populations and their interactions with humans and domestic animals (TWS 2014).

The American Association of Wildlife Veterinarians includes as their mission "to stress the importance of the interrelationships of humans, domestic animals, and wildlife as reservoirs of disease" and "to educate...about the importance of wildlife preventive medicine and disease in relation to the wildlife resource and domestic species." (AAWV 2014)

It is under these baseline objectives and policies which these organizations issue this joint statement.

Literature Cited

- American Association of Wildlife Veterinarians (AAWV). 2014. <http://aawv.net>. Last viewed December 28, 2014.
- Besser, T.E., E. F. Cassirer, K.A. Potter, K. Lahmers, J. L. Oaks, S. Shanthalingam, S. Srikumaran, and W. J. Foreyt. 2014. Epizootic Pneumonia of Bighorn Sheep following Experimental Exposure to *Mycoplasma ovipneumoniae*. Browning GF, ed. *PLoS ONE*. 9(10):e110039. doi:10.1371/journal.pone.0110039.
- Buechner, H.K., 1960. The Bighorn Sheep in the United States, Its Past, Present, and Future. Wildlife Monograph 4, The Wildlife Society, Washington, D.C. 174 pp.
- Cox, M. and T. Carlson. Wild Sheep Disease Events & Management Actions among Western States and Provinces. Presentation at the 2012 Western Association of Fish and Wildlife Agencies, Wild Sheep Working Group, Wildlife Professional's Meeting, Reno, NV.
- Foreyt, W. J., et al. 1994. Fatal pneumonia following inoculation of healthy bighorn sheep with *Pasteurella haemolytica* from healthy domestic sheep. *Journal of Wildlife Diseases* 30: 137-143.
- George, J. L., D. J. Marin, P. M. Lukacs, and M. W. Miller. 2008. Epidemic pasteurellosis in a bighorn sheep population coinciding with the appearance of a domestic sheep. *J Wildl Dis. Apr*; 44(2):388-403.
- Gilmour, N. J. L. and J. S. Gilmour. 1989. Pasteurellosis of sheep. In *Pasteurella and Pasteurellosis*. Adam C. and Ruter J. M. (eds). Academic Press, London UK. Pp. 223-262.
- Lawrence, P. K., S. Shanthalingam, R. P. Dassanayake, R. Subramaniam, C. N. Herndon, D. P. Knowles, F. R. Rurangirwa, W. J. Foreyt, G. Wayman, A. M. Marciel, S. K. Highlander, and S. Srikumaran. 2010. Transmission of *Mannheimia haemolytica* from domestic sheep (*Ovis aries*) to bighorn sheep (*Ovis canadensis*): unequivocal demonstration with green fluorescent protein-tagged organisms. *Journal of Wildlife Diseases* 46:706-717, and erratum (46:1346-1347).
- Martin, W. B. 1996. Respiratory infections of sheep. *Comp. Immun. Microbiol. Infect. Dis.* Vol. 19, No. 3, pp.171-179
- Seton, E.T. 1909. *Lives of Game Animals*. Charles T. Branford, Co., Boston, Massachusetts. 780 pp.
- The Wildlife Society (TWS). 2010. Final Position Statement, Livestock Grazing on Rangelands in the Western U.S. http://wildlife.org/wp-content/uploads/2014/11/Livestock-Grazing_March-2010_Renewed-Oct.15.pdf. Last viewed December 28, 2014.
- Wehausen, J. D., R. R. Ramey II, and S. T. Kelley. 2011. Domestic sheep, bighorn sheep, and respiratory disease: a review of experimental evidence. *California Fish and Game* 97:7-24.
- Western Association of Fish and Wildlife Agencies, Wildlife Health Committee. 2014. Bighorn Sheep Herd Health Monitoring Recommendations. 29 pp.
- Western Association of Fish and Wildlife Agencies, Wild Sheep Working Group. 2012. Recommendations for Domestic Sheep and Goat Management in Wild Sheep Habitat. 24 pp.

TWS Wildlife Diseases Working Group Annual Meeting

Tuesday, Oct. 20, 2015, 7:30 AM - 9:30 AM

Delta Assiniboine B

Winnipeg Canada

DRAFT! Agenda

Meeting Moderator: (Richard Chipman and Margaret Wild)

- ◇ Welcome and Introductions (All)
- ◇ Elections Results (Rick Brown/Richard Chipman)
- ◇ Minutes (Tim Algeo)
- ◇ Treasurer's Report (Tim Algeo)
- ◇ Reminders of Symposia and Meetings co-sponsored by the WG
 - * Quantitative Approaches to Wildlife Diseases (co-organizers Robin E. Russell; Evan Grant; William Kendall; David Miller; Michael Samuel; and Dan Walsh)
 - * Highly Pathogenic Avian Influenzas in North America (co-organizers Ann Ballman, Barb Bodenstein, Bob Dusek, Thomas DeLiberato, Tom Gidlewski, Kristen Mansfield, and Colin Gillin)
- ◇ Committee Reports
 - * Audit (Krysten Schuler and Mike Samuel)
 - * Communications
 - * Newsletter (Sam Goldstein, Katherine Saylor, Michelle Rosen)
 - * Website (Stacy Samuelson and Stacie Robinson?)
 - * Membership (Jordona Kirby)
 - * Nominations and Elections (Rick Brown)
 - * Special Committees
 - * Student Interactions and Travel Grants (Mike Samuel)
- ◇ Old Business
 - * Opportunities for collaboration with Urban or Wildlife Damage Working Groups (volunteer liaisons?)
- ◇ New Business
 - * 2016 TWS Annual Meeting - call for proposals for Field Trips, Workshops, Symposia
 - * Encouraging submission to The Vector.
 - * WDWG Collaboration 2016 Wildlife Disease Association Meeting in Ithaca NY (Krysten Schuler)
 - * Discussion of reworking the Student Travel Grant Awards (Mike Samuel)
 - * WDWG Role in Updating TWS Position Statements (Margaret Wild/Richard Chipman)
 - * Other?

GOALS - Consistent with the goals of The Wildlife Society, the goals of the Wildlife Diseases Working Group are:

1. Facilitate communication and the exchange of information among members of The Wildlife Society interested in various aspects of disease issues involving wildlife and between The Wildlife Society and other professional organizations and institutions with responsibility for the health and welfare of wildlife.
2. Facilitate cooperation among government and nongovernmental organizations involved in prevention, research, surveillance, and management of disease agents or issues and seek input from and coordinate with existing professional organizations that focus on diseases in wildlife.
3. Enhance knowledge and technical capabilities of wildlife professionals in the area of disease prevention, research and management.
4. Increase public awareness, knowledge and appreciation of ongoing research and management efforts concerning diseases involving wildlife.
5. Promote undergraduate and graduate student interest and participation in wildlife disease research and management.

(Continued from page 2)

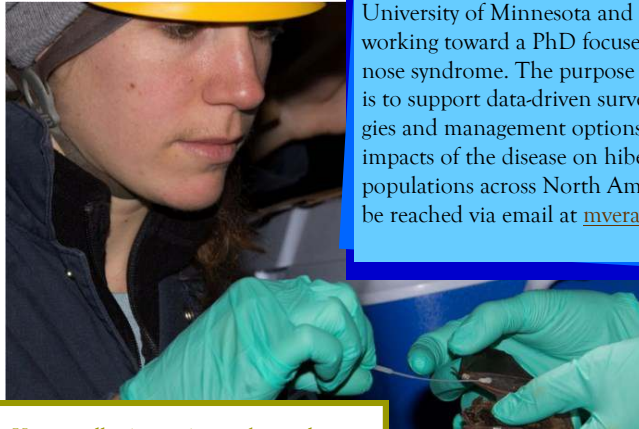
gy of a hibernating bat; however, a concurrent increase in bicarbonate suggested animals were attempting to re-balance this presumably harmful acidosis. High potassium concentrations, which can inhibit normal heart function, were also found in infected bats.

Our results indicate that WNS is a progressive disease with harmful effects occurring before apparent clinical signs. Integrating our data with results published by others, we proposed a multi-stage model that describes the progression of pathology and physiologic effects that lead to mortality of hibernating bats (Verant et al. 2014). This model provides a framework for understanding the pathogenesis of WNS and identifies key hypotheses for further research.

Although no direct treatments are currently available, scientists are testing multiple options. As our management toolbox for WNS expands, it will be important to know when and how to intervene. It's clear that early intervention to prevent or reduce infection will be important for protecting bats against this deadly and spreading disease.

Minimizing additional stressors and ensuring that bats enter hibernation in good condition also provides them with the best chance for survival. Current management strategies for WNS strive to accomplish these goals by protecting bat habitat and restricting access to caves and mines where bats hibernate.

As WNS continues its deadly advance across North America, silent mist nets and empty shadows tell a sad story. Some populations of bats are persisting with the disease, but it is unknown whether these remnant populations will be able to rebuild their kingdom or if bats of North America will remain forever changed.



Michelle Verant collecting a wing swab sample to test for the fungus that causes white-nose syndrome on a little brown bat in a Wisconsin mine.

Dr. Michelle Verant is an NIH T32 Post-doctoral Trainee at the University of Wisconsin-Madison, School of Veterinary Medicine. She completed her DVM and MPH at the University of Minnesota and is currently working toward a PhD focused on bat white-nose syndrome. The purpose of her research is to support data-driven surveillance strategies and management options for mitigating impacts of the disease on hibernating bat populations across North America. She can be reached via email at mverant@usgs.gov.

Full-text of the manuscript is available online:

Verant, ML, CU Meteyer, JR Speakman, PM Cryan, JM Lorch, DS Blehert. (2014) White-nose syndrome initiates a cascade of physiologic disturbances in the hibernating bat host. *BMC Physiology*. 14:10 <http://www.biomedcentral.com/1472-6793/14/10>

ResearchGate: https://www.researchgate.net/profile/Michelle_Verant/

LinkedIn: <https://www.linkedin.com/pub/michelle-verant/59/652/279>

TWS WDWG Board Elections

Chair Elect Nominee - Julie A. Blanchong

I am an Associate Professor of Wildlife Ecology in the Department of Natural Resource Ecology and Management at Iowa State University. My lab is interested in identifying factors responsible for the occurrence, frequency, and distribution of diseases in wildlife. I have been a member of The Wildlife Society since 1999, and I am currently an Associate Editor for the *Wildlife Society Bulletin*.

I have been an active member of the Wildlife Diseases Working Group since it was formed, and I am currently finishing up a term as a member of the Board. My main contribution thus far has been helping to organize symposia sponsored by the working group ("Diseases affecting marine wildlife: causes, conflicts, and solutions", Monterey 2009; "Application of molecular and genetic techniques to wildlife epidemiology", Milwaukee 2013; "Genetic applications to deer management: insights into populations, movements, and disease", Pittsburgh 2014). I am eager to become more involved and will work to promote the Wildlife Diseases Working Group as a venue to increase awareness of disease issues in wildlife management and conservation, as a source of expertise to the Wildlife Society about disease issues involving wildlife, and as a forum for communication between disease researchers and wildlife managers.



(Continued on page 7)

TWS WDWG Board Elections (Continued from page 6)

Chair Elect Nominee - Holly Ernest

I am a wildlife ecologist (PhD Ecology, UC Davis; BS Biology, Cornell University) and research veterinarian (DVM Ohio State University; MS Veterinary Pharmacology & Physiology) with focus on collaborative genomic and disease ecology research and education applications to benefit wildlife population health, conservation, and management. My current position is professor at the University of Wyoming with research, teaching, and service appointment to focus on Wildlife Genomics and Disease Ecology. I hold an endowed professorship, Wyoming Excellence Chair in Disease Ecology, with appointment in the Department of Veterinary Sciences and membership in the Uwyo Program in Ecology. The work of my lab involves applications of wildlife host and pathogen genomics at the landscape and population levels to benefit applied wildlife conservation and management. Wildlife species range from carnivores (mountain lions, sea otters, black bears), ungulates (pronghorn, bighorn sheep, deer), birds (hawks, owls, corvids, hummingbirds), and wild pigs. Pathogens studied range among viruses (West Nile virus, avian pox virus), bacteria, protozoal parasites including hemoparasites, and nematodes. www.wildlifegenetichealth.org and www.vetmed.ucdavis.edu/vgl/wildlife.html. I am a federally permitted Master bander for hummingbirds and have an active field research component.

I genuinely look forward to providing more service to The Wildlife Society and specifically the Wildlife Disease Working Group



(WDWG). I have been a member of TWS for years for more than 10 years and member of Wildlife Disease Working Group for past several years. I am passionate about promoting and working to benefit the mission and membership of TWS as a professional organization, and

the Wildlife Disease Working Group. During time as faculty member at UC Davis (12 years) I worked in leadership roles on executive committees of graduate groups in Epidemiology, Ecology, Genetics, at various times), and working to start new initiatives (founded a new Ecological Genomics focus group for PhD students at UC Davis as an example of enjoying working in teams, can-do and win-win spirit and desire to help lead and facilitate productive meetings and initiatives. I am involved in organizations including the Wildlife Disease Association and serve as secretary for the WDA Wildlife Veterinary Section; American Association of Wildlife Veterinarians, Ecological Society of America and its Disease Ecology Section, Western Bird Banding Association, and American Ornithologists Union. I have energy and organizational skills to serve TWS in the Wildlife Disease Working Group, as well as helping develop new initiatives, critically thinking through issues and helping to solve challenges for our group.

I enjoy working as part of a team, and really look forward to working more actively with this group. I aim to increase connections among wildlife health specialists not only within North America, but especially world-wide. My diverse work experiences provide me with humility, insights, and desire help TWS-WDWG build bridges and accomplish its goals.

Secretary/Treasurer Nominee - Anne Ballmann

I am a wildlife disease specialist/field epidemiologist at the USGS-National Wildlife Health Center (Madison, WI), a federal diagnostic and research laboratory dedicated to assisting state, federal and tribal management agencies investigate disease in free-ranging North American wildlife. I earned my DVM at the University of Tennessee-Knoxville and my PhD in Comparative Medicine-Population Health at North Carolina State University (Raleigh). I am actively involved in research and multi-agency coordination for bat white-nose syndrome (WNS) and currently serve as the Lead for the WNS Diagnostic Working Group



as well as on the WNS National Coordination Team.

Professional organizations of which I am a member include TWS, Wildlife Disease Association, American Association of Wildlife Veterinarians, and the American Veterinary Medical Association. I have participated as an instructor or co-organized several wildlife disease workshops and symposia sponsored by the Wildlife Disease Working Group (WDWG) at annual TWS Conferences as well as workshops sponsored by the WI Chapter of TWS. I would welcome the opportunity to participate more actively within the WDWG by serving as your Secretary-Treasurer.

(Continued on page 8)

TWS WDWG Board Elections (Continued from page 7)

Secretary/Treasurer Nominee - Julia Burco



I have been a member of the WDWG for the past 5+ years. Playing a more active role in the Wildlife Disease Working Group (WDWG) of The Wildlife Society in a position such as Secretary/ Treasurer would be a perfect opportunity to share many of the experiences I have learned early in my career and coordinate with other wildlife health professionals. In this position I look forward to increasing the membership and involvement of the WDWG in the face of so many pressing wildlife health issues. I have diverse background in wildlife health; ranging from oil spill response and avian infectious disease research from my PhD work with the Wildlife Health Center at UC Davis to working with a diverse array of free-ranging wildlife and health issues in my current position as a state wildlife veterinarian for Oregon Department of Fish and Wildlife for the past five and a half years. I am very passionate about training students, biologists, and the public in techniques for monitoring and evaluating wildlife health and currently organize our busy externship program for 4th-year veterinary students interested in wildlife medicine. I had the opportunity to help organize and put on the “Investigating Wildlife Disease: Sampling and Interpretation Techniques for Biologists” workshop at the national TWS meeting held in Portland, Oregon in 2012, which was a great showcase of the expertise that the WDWG has to offer. I look forward to increasing the membership and involvement of the WDWG in the future expansion of so many pressing wildlife

health issues. The most important thing I have learned thus far in my career is the importance of good communication and to collaboration with a diversity of public, private and government entities to successfully address wildlife disease and health issues across the landscape.

Board Member Nominee - Timothy P. Algeo

I am a wildlife biologist, currently employed as the Program Analyst for the USDA, APHIS, Wildlife Services (WS) National Rabies Management Program. Prior to that, I worked for WS as the Rabies Wildlife Biologist for the MA/CT/RI program and as a Wildlife Specialist for WS in Vermont, where in addition to rabies work and other duties, I worked on a Hantavirus project in collaboration with the CDC. I hold a BS in Biology from Johnson State College, an MS in Wildlife Conservation from the University of Massachusetts, have studied in the Department of Public Health at the University of Massachusetts, and recently completed a Ph.D. in Natural Resources and Environmental Studies at the University of New Hampshire. I am also a graduate of the 2005 class of the USDA, APHIS Advancing Leaders Program. As a member of The Wildlife Society, I served as Chair of the Conservation Affairs Committee of the New England Chapter, and as the initial interim Secretary/Treasurer of the Wildlife Diseases Working group, as well as two elected terms in that office. I am also a member of the Wildlife Disease Association, and served a term as President of the Northeast Association of Wildlife Damage Biologists. I would be honored by the opportunity to serve as a Board Member of the TWS Wildlife Diseases Working group to help further the agenda of the group and keep wildlife disease management a top priority for The Wildlife Society and our professional community.



Board Member Nominee - Alan Franklin

I am a Supervisory Research Biologist and Project Leader for the Wildlife Pathogens and Food Security & Safety Project at the National Wildlife Research Center, Fort Collins, Colorado. Prior to joining the National Wildlife Research Center, I was a Research Scientist at the Colorado Cooperative Fish and Wildlife Research Unit at Colorado State University. I received a B.S. in Wildlife Science from Cornell University, an M.S. in Wildlife from Humboldt State University, and a Ph.D. in Wildlife Ecology from Colorado State University. I currently maintain adjunct faculty positions at Colorado State University, Humboldt State University and University of Minnesota. My current research interests in wildlife disease focus on the ecology of avian influenza and bacterial pathogens in wildlife and the potential for transmission of pathogens from wildlife populations to agricultural operations and human populations.

I have been a member of The Wildlife Society since 1989 and the Wildlife Disease Working Group since its inception. I served as a Board Member for the Wildlife Disease Working Group from 2010-2011. I have worked with the TWS Wildlife Disease Working Group to chair and co-chair multiple TWS conference symposia and workshops. I was also involved with developing Wildlife Disease Working Group position statements on various issues. As a Board Member, I would like to assist the Working Group in continuing to maintain a prominent role in TWS as the “go to” organization for wildlife disease issues, encourage interactions with other TWS Working Groups, wildlife biologists, veterinarians, and medical professionals in resolving wildlife disease issues, and continue to expand our influence as an effective organization.



(Continued on page 9)

TWS WDWG Board Elections (Continued from page 8)

Board Member Nominee - Barb Bodenstein

I am a wildlife biologist serving as the Wildlife Disease Specialist within the USGS National Wildlife Health Center (NWHC), providing expertise and partnering with Federal, State and Tribal natural resource agency field personnel in conducting wildlife disease field investigations throughout the United States. Over my career, I have developed diverse cooperative partnerships with a variety of Federal, State, Tribal agencies, non-governmental entities and the general public regarding wildlife disease investigations and response to wildlife morbidity/mortality events. I also participate in epidemiological field investigations and research focusing on understanding the ecology of disease agents and the potential impacts on wildlife populations.

During my career, I have also worked as the Wildlife Disease Biologist for Wisconsin and Minnesota for the USDA APHIS Wildlife Services National Wildlife Disease Program and with the WI Department of Natural Resources wildlife health program. Professional development within The Wildlife Society at both the local and National level and the Wildlife Disease Association has remained an important component. I have been involved with Wildlife Disease Working Group since it was created. I enjoy co-organizing symposiums on Wildlife Disease



Ecology and Management, workshops and field trips for wildlife professionals and students such as the one held at 2013 TWS Annual Conference in Milwaukee, Wisconsin. I also present wildlife disease and health information of significance at TWS annual meetings at both the local and national levels, as this provide wildlife professionals with situational awareness of morbidity and mortality events.

Conducting wildlife disease identification and field response training workshops for wildlife professionals and students at various forums remains a top priority for me. Preparedness for and response to disease outbreaks in wildlife requires multi-disciplinary collaborative partnerships and effective communications between wildlife health professionals; wildlife management professionals; wildlife researchers and in some instances domestic animal and human health professionals, as well as the general public are key to disease investigations. The WDWG is a great forum to cross foster many of these activities, create strong partnerships, provide disease training workshops and provide wildlife professionals with information and raise awareness on potential disease threats. I would welcome the opportunity to serve on the TWS WDWG Board to continue to promote wildlife biologists and wildlife health professionals working together on disease investigations and management to promote healthy wildlife populations.

Board Member Nominee - Sonja Christensen

I am currently a PhD student and Boone and Crockett Fellow in the Department of Fisheries and Wildlife at Michigan State University. Originally from Bemidji, Minnesota, I graduated



with a biology degree from Minnesota State University, Mankato in 2005. While completing my undergraduate degree, I worked for the Minnesota DNR farmland wildlife population research group as a wildlife biology research intern, focusing on white-tailed deer and furbearer species. In 2006, I began my M.S. research through Penn

State University and the Pennsylvania Cooperative Fish and Wildlife Research Unit. I evaluated habitat use, movement, and survival rates of white-tailed deer and exotic sika deer on Assateague Island National Seashore, Maryland. In April of 2008, I accepted the Deer/Moose project lead position with the Massachusetts Division of Fisheries and Wildlife where I was responsible for research and management of deer, moose, and captive ungulates in the state. I then spent two years working on ungulate research at the University of Montana before moving in August 2013 to Michigan to begin my PhD research on white-tailed deer and disease ecology at Michigan State University. Specifically, my current research is focused on Epizootic Hemorrhagic Disease in free-ranging deer populations in the upper Midwest. More broadly, my interests include wildlife disease ecology and management, with a particular focus on population ecology and conservation medicine. I presently serve as a coordinator for the AWFA Fish and Wildlife Health Initiative committee and as a board member for the MI chapter of TWS. I am eager to engage with others in the wildlife disease profession and serve as a board member for the Wildlife Disease Working Group. As my work in wildlife disease evolves, I hope to collaborate with those in the WDWG and contribute to research areas of need identified by this group of professionals.

(Continued on page 10)

TWS WDWG Board Elections (Continued from page 9)

Board Member Nominee - Steve Sweeney

I am a wildlife veterinarian and senior analyst with USDA APHIS Veterinary Services, Center for Epidemiology and Animal Health. Currently, my work focuses on feral swine disease ecology and modeling projects generated through the APHIS National Feral Swine Damage Management Program. I also contribute to USDA climate change documents and a health survey of the U.S. ranched bison industry. I have a longstanding interest in brucellosis and other diseases of bison, having worked as a researcher and consulting veterinarian in the Greater Yellowstone Area. I grew up in the Pacific Northwest, where I received my B.S. in zoology, M.S. in wildlife/forest resources (both at the University of Washington) and DVM degree (Washington State University).



I have been a Certified Wildlife Biologist since 1990 and a member of TWS' Wildlife Disease Working Group since 2010. As a current federal employee, former wildlife program manager and veterinary faculty member, I would be honored to serve our community as a WDWG board member. I place great value on mentoring the next generation of animal health professionals who intern with our programs at APHIS and would bring this same commitment to TWS as a Working Group member for wildlife health. Thank you for considering me as your representative.

Board Member Nominee - Clay Hilton

I am an Associate Professor and Director of Veterinary Technology at Texas A&M University-Kingsville. I am a member of the Science Team at the Caesar Kleberg Wildlife Research Institute and a member of the Professional Advisory Group for the East Foundation, the second-largest system of ranches in Texas. I received a B.S. in Wildlife Biology, an M.S. in Wildlife Ecology and a DVM from Auburn University.

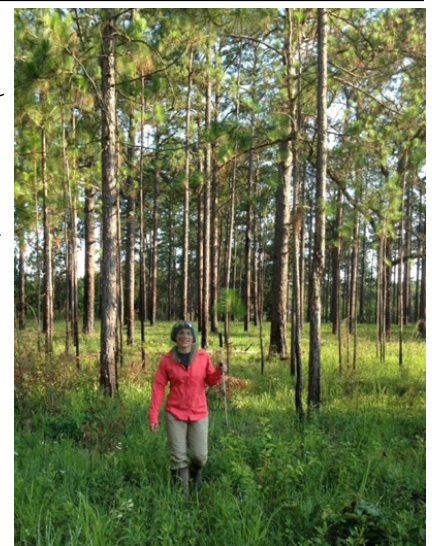
Service is essential to the success of our professional associations and for that reason I serve on the Cervid Health Committee of the Texas Veterinary Medical Association, the Veterinary Feed Directive Committee of the American Veterinary Medical Association and am on the Advisory Board of the Wildlife Veterinary Section of the Wildlife Disease Association. Service on the Board of TWS's Wildlife Disease Working Group would be very rewarding because it would allow me

to work with like-minded professionals to produce information that can be used to develop wildlife management practices that benefit wildlife, the environment and people.



Board Member Nominee - Jordona Kirby

I received my B.S. in Wildlife Conservation from the University of Delaware in 2002, and my M.S. from the University of Georgia in 2004, studying bobcat ecology in a longleaf pine ecosystem in southwestern Georgia. I began working for USDA, APHIS, Wildlife Services in 2005, focusing on mitigating wildlife hazards at airports and landfills in Kentucky. I also began working on raccoon rabies surveillance as part of the state's participation in the National Rabies Management Program (NRMP), followed by serving as the Rabies Wildlife Biologist for WS in Tennessee for 3 years. Since 2010, I have been Rabies Field Coordinator for the NRMP. In this capacity, I coordinate the field logistics for distribution of oral rabies vaccine (ORV) baits in 14 eastern states to manage rabies in raccoons and other wildlife. I have been a member of TWS for almost 15 years. I served a term as Secretary of the Kentucky Chapter of TWS, and I participated in the inaugural class of the Leadership Institute in 2006. I am fortunate to have served 2 terms as the Secretary/Treasurer for the Wildlife Diseases Working Group, and have served one term as a Board Member. I would like to continue active involvement in one of TWS' largest working groups. Participation at the working group level affords opportunities for continual learning by all members and provides an excellent forum for open dialogue regarding wildlife health issues.





Officers and Board Members

Executive Board

Richard Chipman (Chair) Richard.B.Chipman@aphis.usda.gov
Margaret Wild (Chair-Elect) Margaret_Wild@nps.gov
Richard Brown (Past-Chair) RBrown@humboldt.edu
Tim Algeo (Secretary/Treasurer) Timothy.P.Algeo@aphis.usda.gov

Board Members

Jordona Kirby Jordona.D.Kirby@aphis.usda.gov
Julie Blanchong julieb@iastate.edu
Krysten Schuler ks833@cornell.edu
Katrina Alger kealger@syr.edu
Denise Ruffino Denise_Ruffino@fws.gov
Jack Mortenson Jack.Mortenson@oregonstate.edu

Committee Chairs

Julie Blanchong (Technical Sessions) julieb@iastate.edu
Sarah Hamer (Student Affairs) shamer@cvm.tamu.edu
Richard Brown (Nominations and Elections) RBrown@humboldt.edu
Jordona Kirby (Membership) Jordona.D.Kirby@aphis.usda.gov

Newsletter Editors: Sam Goldstein Samuel.M.Goldstein@aphis.usda.gov
Katherine Saylor Saylork@ufl.edu

Webpage Editors: Stacy Samuelson desert_bnd@hotmail.com
Stacie Robinson Stacie.J.Robinson@gmail.com

Mission Statement

The mission of the Wildlife Diseases Working Group is to promote better scientific understanding of the causes and consequences of disease in ecosystems and wildlife populations; to apply the principles of wildlife science, ecology, and epidemiology to the prevention and management of diseases in wildlife; to foster education and transfer of information on diseases to wildlife management professionals and the public; and to apply this knowledge to enhance the health and conservation of wildlife populations and their interactions with humans and domestic animals.

Current Research in Wildlife Disease

Tyler S. Evans, Krysten L. Schuler, and W. David Walter (2014). SURVEILLANCE AND MONITORING OF WHITE-TAILED DEER FOR CHRONIC WASTING DISEASE IN THE NORTHEASTERN UNITED STATES. *Journal of Fish and Wildlife Management: December 2014, Vol. 5, No. 2, pp. 387-393. doi: <http://dx.doi.org/10.3996/032014-JFWM-021>*. Chronic wasting disease (CWD) is a prion disease that affects both wild and captive cervid populations. In the past 45y, CWD has spread from northern Colorado to all bordering states, as well as the midwestern United States (Midwest) and northeastern United States (Northeast), Canada, and South Korea. Because CWD is a relatively new issue for wildlife management agencies in the Northeast, we surveyed a representative (e.g., cervid biologist, wildlife veterinarian) from 14 states to gain a better understanding of state-specific surveillance measures. Between 2002 and 2012, New York (37,093) and Pennsylvania (35,324) tested the greatest number of harvested white-tailed deer *Odocoileus virginianus* in the Northeast. Additionally, the 14 states surveyed have tested 121,730 harvested deer, or approximately 15,216/y, since CWD was first detected in 2005. The most common tissues used by agencies in the Northeast for testing were retropharyngeal lymph nodes, which have been determined to be the most reliable in detecting CWD in cervids. Understanding CWD surveillance efforts at a regional scale can help to provide guidance for the development of new surveillance plans or the improvement of existing ones. Furthermore, collaborations among state and regional agencies in the Northeast may attempt to identify deficiencies in surveillance by state or subregion.

Christine A. Bozarth, Beth Gardner, Larry L. Rockwood, and Jesús E. Maldonado. USING FECAL DNA AND SPATIAL CAPTURE-RECAPTURE TO CHARACTERIZE A RECENT COYOTE COLONIZATION. *Northeastern Naturalist* 22(1): 144-162. 2015. doi: <http://dx.doi.org/10.1656/045.022.0124>. The arrival of a novel predator in an ecosystem necessitates many wildlife-management decisions that should be based on sound demographic data. *Canis latrans* (Coyote) has experienced a dramatic range expansion across North America since the early 19th century, completing its colonization of the continental US in the mid-Atlantic region over the past 20 years. Their arrival in the suburbs of Washington, DC, has generated much public attention, and demonstrated a need for demographic information about this species. To address the challenges of surveying an elusive animal, we used fecal DNA to describe the population genetics and demographics of a newly colonized Coyote population at Marine Corps Base Quantico (MCBQ) in northern Virginia. We collected 331 scats over a period of 2 years at MCBQ, resulting in identification of 23 unique individual Coyotes and 41 total Coyote captures that were analyzed using spatial capture–recapture models. We found evidence of colonization by multiple genetic lineages and a low population density of 0.047 individuals/km². Importantly, this study incorporates a new class of models on individual animals identified by genotype data derived from fecal DNA and demonstrates the utility of these models in surveying elusive animals.