

Winter 2012

Special points of interest:

- **Commentary –Lead toxicity in California condors**
- **Student paper—Urban barriers, gene flow and pathogen transmission**



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The Vector

The Newsletter of The Wildlife Society
Wildlife Diseases Working Group



From the Chair:

Broadening Our Ideas Into a New Era of Wildlife Management and Conservation

"Oh Beautiful for smoggy skies, insecticided grain,
For strip-mined mountain's majesty
Above the asphalt plain.
America, America, man sheds his waste on thee,
And hides the pines with billboard signs
From sea to oily sea."

- George Carlin

"We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with respect."

- Aldo Leopold

Greetings to the members of the Wildlife Diseases Working Group. In past eras, we discovered the importance of love and respect for our lands, avoiding and cleaning up pollution, continuing issues of habitat loss, degradation and restoration, the critical importance of lands set aside for preservation and conservation, etc., and the importance of these issues continues to increase. In recent years we have come to recognize that, even though the set-asides remain very important, we haven't, and cannot, set aside enough land to protect wildlife in most areas. While agricultural lands (including timber lands, open rangelands, and various types of

(Continued on page 2)

American Association of Wildlife Veterinarians Partners with TWS for 19th Annual TWS Conference in Portland, Oregon (13-18 Oct)



- ◆ AAWV co-sponsored Wildlife Health plenary session and symposia
- ◆ workshop on wildlife necropsy and sampling
- ◆ continuing education credit through ACZM

This is a great opportunity for AAWV members and other wildlife professionals to network and provides the opportunity to broaden the wildlife health professions affiliations through dual membership with this important organization. We look forward to seeing you in Portland this fall!

From the Chair (Cont. from page 1)

farmlands), lands being mined, urban and suburban landscapes, etc., were once seen as anathema by many wildlifers (myself included), we need to recognize their importance and that the people using these lands need to be incorporated into conservation solutions to achieve successes in our future.

I recently enjoyed listening to two lectures by one of my colleagues at HSU who discussed with our freshman students issues concerning the emergence of the “Anthropocene,” and the importance of understanding that our future lies in management and conservation beyond refuges, parks, and wilderness areas. These aren’t new issues; and, of course, Leopold argued for private lands management in the 1940s. Yet we are clearly in a new era, and we need to embrace conservation and management on private lands and specific efforts that directly benefit people. I’ve never considered myself an anthropocentrist, and I have respected and taught the North American Model for over 16 years (and adamantly believed in it for at least a dozen years before that). With that in mind, I also believe that our incredible model needs to be expanded to “fully” incorporate and embrace the needs of people (on this continent and elsewhere), across all landscapes and beyond the needs of a few common user groups.

The One-World-One-Health concept requires that we broaden our ideas beyond issues involving single groups of species (including humans, domestic animals, and wildlife, and any specific species), beyond management of wildlife on specific types of lands, and across multiple spatial (even global) scales, and it [should] force us to consider incorporation of human needs (at all levels and on all types of lands) into all aspects of disease management and conservation. We might curse ourselves with “may we all live in interesting times...” (have any of you not heard that as a quip or a joke?), but I don’t see this as a curse. I see ours as some of the most exciting, challenging (and perhaps the most difficult) times that humans, including conservationists, have ever faced; and whether we like it or not, those interesting times are here. We need to continue to broaden our model for conservation. We need to find the support and funding for the necessary monitoring and management of emergent and important diseases (and I believe that sustainable support is and will remain our greatest problem). We need to continue to expand our vision of wildlife health and find new options for coordinating management of disease issues among different agencies and stakeholders; we need to fully embrace the components of the “One World - One Health concept; and we should merge these ideas with our future “North American Model of Wildlife Conservation.” Of course, these are not my ideas, and similar concepts have been discussed in the recent edition of the Wildlife Professional and elsewhere .

I was excited to see the current edition of the Wildlife Professional, which is focused on wildlife diseases and wildlife health

issues. We should all thank Lisa Moore, Dave Jessup, and all of the authors for their concise explanations of ideas that are often difficult to explain. Publications of these and similar ideas in forums that reach broad audiences (in this case, all of TWS and to others who read the WP) help us all cross a new milestone. No longer do we need to ask whether wildlife diseases are important in wildlife management; it is clear that we can now move on to integration of management and conservation of wildlife, with disease as an important component, to the promotion of human interactions with wildlife in ways that benefit both wildlife and humans. Of course we will see escalating problems associated with interactions and depredation, but we must continue to seek solutions in which neither humans nor wildlife bear the sole burden of the costs. The North American Model of Wildlife Management has had a huge impact on conservation and management throughout the world. The brilliance of the future of this model (and similar models including the North American Model of Wildlife Conservation) will depend on our ability to keep the goals and general directives of the documents flexible enough to deal with the rapidly changing problems of our highly dynamic world – a world increasingly dominated by humans, global travel, global climate change, and by the stochasticity associated with human influences.

Thanks again to all of the authors and editors of the recent Wildlife Professional. Thanks also to the new members who have joined the WDWG; especially our new students! The editors of The Vector are always soliciting articles concerning wildlife projects, ideas related to diseases, news items, or discussion of conceptual ideas that folks are willing to share, and we strongly encourage contributions from students. Please spread the word to strengthen our WG, submit articles to The Vector and please contact me if you’d like to be more involved.

Don’t forget about the upcoming national meeting in Portland. There will be several sessions and workshops concerning disease issues, and it would be a great time to bring a friend (perhaps one of those past WG members who forgot to renew their membership) or a student to the WDWG business meeting! Let’s work together to make this a great year for the WDWG, TWS, and the wildlife for which we all work.

Best Regards,

Rick Brown

The Chair has indicated that opinions presented here do not necessarily represent the ideas or policies of the Wildlife Diseases Working Group or The Wildlife Society.

Lead poisoning in California Condors

Comments from an editor by Claire Crow

One of the many exciting things about Zion National Park is the opportunity to experience California condors. The Arizona-Utah population is managed by The Peregrine Fund, and the birds found in Zion were released in Vermillion Cliffs, Arizona, from 1996 to the present. Recovery of this endangered species depends on the establishment of self-sustaining free-flying populations. From the brink of extinction in the 1970's, captive breeding and subsequent wild nests have brought the total population to over 380 individuals, about half of which are free-flying. There are nearly 80 birds in the Arizona-Utah population, and most of these will spend at least some of the summer in or near Zion.



Male condor (tagged 99) in Zion Canyon. NPS Photo by Cassie Waters.

Two condors at Zion have pair-bonded and chosen to overwinter in the park the last 2 years. Early in 2011, the male (tagged 99) underwent chelation therapy for high blood lead levels. The female (tagged A3) was kept in captivity with the male during his treatment, and

both birds returned to Zion upon release in Arizona. When copulations were observed on multiple occasions this winter, hopes grew high for the first wild Utah nest* in this recovering population. However, the male again had high lead levels requiring chelation therapy this April. The need to treat for lead toxicity once again has disrupted the breeding cycle of this pair. The Peregrine Fund's records show that lead poisoning is the primary cause of death in the Arizona-Utah population. Arizona Game and Fish Department and Utah Division of Wildlife Resources (UDWR) have implemented voluntary nonlead ammunition programs in order to reduce lead in the condors' environment. Alternative ammunition is now available in a variety of gauges and grainweights, with performance equal in quality to lead ammunition. Any kind of change in life takes effort and transition may offer temporary inconvenience. Therefore, I wish to express my genuine appreciation to leaders in wildlife management and conservation who have switched to nonlead ammunition. For TWS position statement on lead, please visit http://joomla.wildlife.org/documents/positionstatements/Lead_final_2009.pdf

*UDWR has stated that in addition to fossil records, there are credible records of California condors in Utah from 1872 and circa 1932.



The condor pair marked with wingtag numbers 99 and A3. NPS Photo.

TWS 19th Annual Conference in Portland, Oregon (13-18 Oct)

TWS Annual Conference in Portland, Oregon Upcoming—TWS' annual conference will be held in Portland, Oregon on October 13-17, 2012. The meeting will include workshops, symposia, panel discussions, breakfast roundtables, special poster sessions, contributed papers (oral presentations), and contributed posters. We invite submission of contributed papers and posters on topics of wildlife ecology, management, conservation, education, or policy. Presentations will not be published, so we encourage reports from the author's most recent scientific investigations and management experiences. Presentations will be audio recorded and made available to conference attendee at the conclusion of the conference. The **deadline for contributed papers and posters is April 13th** and the link for submission can be found at <http://joomla.wildlife.org/documents/portland/call.for.papers.pdf>. Registration for the conference will open in June.

Student Paper:

Urban barriers to wildlife: effects on gene flow and pathogen transmission among bobcats

By Justin Lee

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.

The face of the planet is changing at an unprecedented rate. Formerly natural landscapes are being cleared for agriculture, degraded for resource extraction, and urbanized into large sprawling cities. These activities are aimed at providing the living conditions necessary to sustain the global human population, estimated at nearly seven billion people and growing. This increasing human footprint carries the unintended consequences of drastically modifying the distribution of biodiversity on the planet. In fact, habitat loss and degradation are listed by the International Union for Conservation of Nature as the most common drivers of species declines around the world.

Among the causes of habitat loss and degradation, none more completely alter the landscape than the process of urbanization. Riparian areas are replaced by concrete canals, native vegetation is uprooted for ornamental exotic plants, and automobiles travel along miles of pavement 24 hours a day. Currently there are more than 440 cities in the world with more than one million residents. With 3.7 million city residents and 12.8 million people living within the metropolitan area, Los Angeles, California is the second largest city in the United States and home to one of the busiest highway interchanges in the world - the junction of Interstate-5 and Interstate-405 known as the 'El Toro Y' (Figure 1).

Seeking to understand the impacts (and possible mitigation strategies) of urbanization and freeway development on wildlife is a difficult but important conserva-

tion challenge. Working with scientists from the US Geological Survey and Colorado State University, I investigated the extent to which I-5 and other freeways in the region limit the movement of bobcats among habitat patches on the urban edge of Los Angeles. We hypothesized that bobcats would avoid these freeways, resulting in decreased connectivity and gene flow between patches bisected by these busy roads. We therefore predicted that low levels of migration across freeways would lead to physically and genetically isolated bobcat subpopulations on either side of these freeways. We further predicted these barriers to animal movement would also reduce pathogen spread among habitat patches.

We analyzed molecular markers from 106 bobcats across habitat patches bisected by three major freeways that represented a gradient of traffic volume and useable wildlife underpasses. To support our analysis of host genotypes, we also looked for evidence of genetic structuring among feline immunodeficiency virus (FIV), an obligate viral pathogen infecting approximately 20% of the bobcats. Because FIV infection is life-long, and only transmitted by direct contact among individuals, we reasoned

FIV genomes could also act as markers of bobcat movements and contacts throughout the landscape. Furthermore, since the mutation rate of the virus is several orders of magnitude faster than that of mammalian DNA, we postulated that changes in the genetic signature of the virus would reflect population trends on a much shorter timescale than is possible by analyzing host genetics alone. Also, the ecology of FIV in bobcats in the region is not influenced by alternative hosts, as domestic cats and bobcats harbor divergent species-specific strains of the virus.

Our genetic analyses provided strong evidence of population structuring



US Geological Survey aerial image of the 26 lane-wide El Toro Y.

Student Paper (Cont. from page 4)

between bobcats on the east and west sides of the El Toro Y and the I-5 corridor, indicating that the freeway and its surrounding urban development do indeed limit bobcat movement and gene flow. The two subpopulations were genetically distinct at most of the 16 microsatellite loci analyzed, and exhibited differences in genetic diversity and average relatedness. None of these findings would be expected if bobcats on both sides of the freeway formed one randomly mating, panmictic population. Two other freeways in the area, which have less traffic and more wildlife underpasses, did not appear to limit bobcat movement or gene flow. Remote cameras placed near each of these freeways documenting the presence or absence of bobcat movement support the findings of our genetic analyses.

Interestingly, and in contrast to our hypothesis that FIV genetic structure would mirror that of its bobcat host, phylogenetic analyses of FIV isolates from 19 infected bobcats found no association be-



Monitoring vital signals of an anesthetized bobcat during a 2008 field capture in western Colorado.

tween the genetic structuring of the viruses and that detected among bobcats. Despite the low level of bobcat movement and gene flow observed across I-5, individuals on both sides of the freeway were infected with closely related viral isolates which could not be assigned to east and west groups. This finding was unexpected because previous studies have shown a close association between FIV genetic structure and the distribution of bobcats and mountain lions. *Therefore, while the I-5 corridor restricts gene flow between the two subpopulations, it appears that movement and contact between the two groups produces enough transmission to admix the viral population.* It is possible that infected juvenile male bobcats, dispersing from their natal area to establish a breeding territory, are responsible for much of the virus movement. Investigating this hypothesis is an area of further interest for our collaborative research group.

These findings have conservation implications as small, genetically isolated populations are prone to the loss of genetic diversity due to genetic drift, and decreased fitness through inbreeding depression. However, our work suggests that urban barriers, which reduce movement and interbreeding among subpopulations, may not necessarily prevent the spread of disease. This implies the two groups should be managed as a unit in the face of future infectious disease outbreaks. Furthermore, disease outbreaks could be more severe in populations such as these which exhibit decreased genetic diversity.

This work was presented in the 'Wildlife and Roads in Urban Ecosystems' symposium at the 2012 TWS annual conference, and was recently published in the journal *Molecular Ecology*. Funding for this research was provided by an NSF-NIH Ecology of Infectious Disease grant and a Morris Animal Foundation Wildlife Fellowship.

Lee J, Ruell E, Boydston E, Lyren L, Alonso R, Troyer J, Crooks K, VandeWoude S. Gene flow and pathogen transmission among bobcats (*Lynx rufus*) in a fragmented urban landscape. *Molecular Ecology*, in press.

Justin received his B.S. in biochemistry from Tulane University. He is currently enrolled in a dual-degree DVM/PhD program at Colorado State University where he studies the ecology and evolution of feline immunodeficiency virus in bobcats and mountain lions. Justin's primary interest is in using genetic techniques to study the ecology and evolution of infectious diseases in natural populations of wildlife.



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 Sarah Hamer Student Affairs hamer@msu.edu
 Kirk Shively Communications kirk.j.shively@aphis.usda.gov
 Keith Wehner Nominations and Elections keith.p.wehner@aphis.usda.gov
 Keith Wehner Membership keith.p.wehner@aphis.usda.gov

Newsletter Editor Claire Crow Claire_Crow@nps.gov
 Newsletter Editor Sam Goldstein Samuel.M.Goldstein@aphis.usda.gov
 Webpage Editor Michael Milleson Michael.P.Milleson@aphis.usda.gov

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.

Meetings, Dates, and Deadlines

1 MAY: Call for papers *Ecology and management of brown tree snakes and other exotic reptiles and amphibians*
 The peer-reviewed journal *Human-Wildlife Interactions* (a publication of the Berryman Institute) will dedicate the fall 2012 issue to the management and ecology of brown tree snakes and other exotic reptiles and amphibians. For submission guidelines, please visit <www.BerrymanInstitute.org>. For more information, contact the managing editor: hwi@aggiemail.usu.edu.

1 JUNE: Call for Student Research-In-Progress Posters for TWS conference in Portland. See <http://wildlifesociety.org/call-for-student-research-in-progress-posters/>

Vector Submission and Production Schedule

The editors of the Vector welcome your contributions. If you wish to submit an article, but suspect you won't quite make the deadline, please contact Claire_Crow@nps.gov, and Samuel.M.Goldstein@aphis.usda.gov to arrange for an alternate submission date.

	Submission deadline	Publication date
Spring (Vol. 6, Issue 2)	6-Jun-12	27-Jun-12
Summer (Vol. 6, Issue 3)	6-Sep-12	26-Sep-12

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