Summary

Meeting dates: August 8-9, 2013

Agenda item: Elk Hoof Disease Diagnostic and Management Update – Briefing

Presenter(s): Dr. Sandra Jonker, WDFW Region 5 Wildlife Program Manager
Dr. Kristin Mansfield DVM, MPVM, WDFW Wildlife Veterinarian

Background summary:
The Department is working with specialists, here and abroad, to understand what is causing hoof disease in southwest Washington elk. The Department and cooperating researchers and veterinarians have extensively analyzed samples from 43 elk of different ages from areas with elk affected by hoof disease and from areas that are not affected by hoof disease. So far, we have ruled out several potential causes and have narrowed the list of possibilities. Evidence suggests the involvement of an infectious bacterium associated with elk hoof disease.

The Department has established a Technical Advisory Group (HDTAG) composed of veterinarians and researchers to guide the diagnostic effort and a Public Working Group (HDPWG) to discuss research and management questions and options, share information, and communicate with the public. The Department has compiled all the input from the HDPWG, HDTAG, and WDFW staff to develop a management approach in response to hoof disease and address the top 3 research needs that have developed from the ongoing analyses and discussion: 1) What is the prevalence of hoof disease in elk?, 2) What is the distribution of hoof disease on the landscape?, and 3) What is the effect of hoof disease on the population (i.e., survival/reproduction)?

Department Staff will brief the Commission on the elk hoof disease diagnostic findings to date, and assessment of those findings by the WDFW Elk Hoof Disease Technical Advisory Group. Department Staff will provide an update on the proposed management and research efforts in response to the diagnostic findings.

Policy issue(s) you are bringing to the Commission for consideration:
N/A

Public involvement process used and what you learned:
The Department has established a Technical Advisory Group (HDTAG) composed of veterinarians and researchers to guide the diagnostic effort, assist with interpretation and assessment of laboratory findings, and discuss disease management and research options. The HDTAG is made up of 16 veterinarians and researchers with expertise in microbiology, epidemiology, toxicology, food animal medicine, disease diagnostics, pathology, public health, wildlife veterinary medicine, and regulatory veterinary medicine representing several universities, government agencies, and local veterinary practices.

The Department established a Public Working Group (HDPWG) to discuss research and management questions and options, share information, and communicate with the public. The HDPWG is made up of 18 individuals representing multiple entities vested in this issue including County Commissioners, private and public landowners, local businesses, sportsman groups, government agencies, and universities.

The Department has held and participated in several public meetings. Input from the HDTAG, HDPWG, and the public meetings informed the management and research options in response to hoof disease.
Action requested:
N/A

Draft motion language:
N/A

Justification for Commission action:
N/A

Communications Plan:
In September 2012, the Department launched a website to share information about reports of hoof disease and an online reporting tool for the public to report sightings of limping animals.

From September 2012 to present multiple news releases have been shared with information on research conducted, updates on findings, opportunities for public comment, and reporting options. In less than two years the Department has participated in 9 public meetings, including a briefing to the Commission in June of 2013, in locations such as Long View, Olympia, Vancouver, Chehalis, and Cathlamet. These meeting have been well attended and allowed staff to share current research, receive public comment, and address concerns.

In January 2014 the Department also developed an informational brochure about hoof disease in Southwest Washington for distribution at sportsman shows, stores, offices, etc. In addition, the Department has included information regarding what is known to date about hoof disease in the 2013 and 2014 harvest regulations pamphlets.

WDFW veterinary staff and collaborators are reporting diagnostic findings at professional society meetings, in scientific journals, and veterinary association newsletters.
## WDFW Elk Hoof Disease Technical Advisory Group (TAG)

<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
<th>Title/Expertise/Rationale</th>
<th>Websites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. George Barrington</td>
<td>WSU</td>
<td>Professor, Large Animal Internal Medicine</td>
<td><a href="http://www.vetmed.wsu.edu/people-vcs/faculty/barrington.aspx">http://www.vetmed.wsu.edu/people-vcs/faculty/barrington.aspx</a></td>
</tr>
<tr>
<td>Dr. Tom Besser</td>
<td>WSU</td>
<td>Professor, Veterinary Microbiology and Pathology; Faculty, Paul G. Allen School for Global Animal Health</td>
<td><a href="http://www.vetmed.wsu.edu/people-vmp/faculty/Besser.aspx">http://www.vetmed.wsu.edu/people-vmp/faculty/Besser.aspx</a></td>
</tr>
<tr>
<td>Dr. Julia Burco</td>
<td>ODFW</td>
<td>ODFW District Wildlife Veterinarian</td>
<td><a href="http://www.dfw.state.or.us/">http://www.dfw.state.or.us/</a></td>
</tr>
<tr>
<td>Dr. Anne Fairbrother</td>
<td>Exponent</td>
<td>Principle Scientist, Ecotoxicology and Environmental Risk Assessment</td>
<td>Included with notebook materials</td>
</tr>
<tr>
<td>Dr. John Gay</td>
<td>WSU</td>
<td>Associate Professor, WSU Field Disease Investigation Unit</td>
<td><a href="http://www.vetmed.wsu.edu/people-vcs/faculty/gayJ.aspx">http://www.vetmed.wsu.edu/people-vcs/faculty/gayJ.aspx</a></td>
</tr>
<tr>
<td>Dr. Gary Haldorson</td>
<td>WSU</td>
<td>Clinical Instructor, Veterinary Microbiology and Pathology</td>
<td><a href="http://www.vetmed.wsu.edu/people-vmp/faculty/haldorson.aspx">http://www.vetmed.wsu.edu/people-vmp/faculty/haldorson.aspx</a></td>
</tr>
<tr>
<td>Dr. Sushan Han</td>
<td>CSU</td>
<td>Assistant Professor, Department of Veterinary Microbiology, Immunology, and Pathology</td>
<td><a href="http://www.cvmbs.colostate.edu/DirectorySearch/Search/MemberProfile/cvmbs/4491">http://www.cvmbs.colostate.edu/DirectorySearch/Search/MemberProfile/cvmbs/4491</a></td>
</tr>
<tr>
<td>Dr. Jason Humphrey</td>
<td>CSU</td>
<td>Knowledge of Local Animal Diseases and Conditions</td>
<td><a href="http://cascadewestvet.com/">http://cascadewestvet.com/</a></td>
</tr>
<tr>
<td>Dr. Dale Moore</td>
<td>WSU</td>
<td>Director, WSU Veterinary Extension; Faculty, Paul G. Allen School for Global Animal Health</td>
<td><a href="https://www.vetmed.wsu.edu/people-vcs/faculty/moore.aspx">https://www.vetmed.wsu.edu/people-vcs/faculty/moore.aspx</a></td>
</tr>
<tr>
<td>Dr. Steve Parish</td>
<td>WSU</td>
<td>Professor, Large Animal Internal Medicine</td>
<td><a href="http://www.vetmed.wsu.edu/people-vcs/faculty/parish.aspx">http://www.vetmed.wsu.edu/people-vcs/faculty/parish.aspx</a></td>
</tr>
<tr>
<td>Dr. Mike Paros</td>
<td>Owner, Paros Veterinary Services; Knowledge of Local Animal Diseases and Conditions</td>
<td><a href="http://www.parosveterinaryservices.com">http://www.parosveterinaryservices.com</a></td>
<td></td>
</tr>
</tbody>
</table>

Updated June 6, 2014
## WDFW Elk Hoof Disease Technical Advisory Group (TAG)

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Position</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Ron Wohrle DVM</td>
<td>WDOH</td>
<td>State Public Health Veterinarian</td>
<td><a href="http://www.doh.wa.gov/AboutUs/ProgramsandServices/EnvironmentalPublicHealth/EnvironmentalHealthSafetyandToxicology/ZoonoticDisease.aspx">http://www.doh.wa.gov/AboutUs/ProgramsandServices/EnvironmentalPublicHealth/EnvironmentalHealthSafetyandToxicology/ZoonoticDisease.aspx</a></td>
</tr>
</tbody>
</table>

Updated June 6, 2014
Anne Fairbrother, DVM, Ph.D.
Principal Scientist and Office Director

Professional Profile

Dr. Anne Fairbrother is a Principal Scientist in Exponent’s EcoSciences practice, with more than 30 years of experience in ecotoxicology, wildlife toxicology, contaminated site assessment, and regulatory science. She has conducted large-area (>100 sq mile) risk assessments in tropical, desert, and mountain ecosystems, determining risk thresholds for plants and wildlife. She provided consultation on future development of mine pit lakes, assessed the risks to livestock during mine closure operations, and conducted assessments of risk to terrestrial and aquatic organisms from selenium and mercury. She has assessed risks to wildlife from organic chemicals, including DDT, PCBs, dioxins, and petroleum hydrocarbons.

Dr. Fairbrother has supported industry groups and businesses in product review and registration, particularly agrichemicals. She has worked in support of U.S., Canadian, and European regulatory processes for both the public and private sectors. Dr. Fairbrother has testified in front of governmental Boards of Review and Science Advisory Boards, and has briefed Congressional committees. She has prepared expert testimony, been deposed, and served as an expert witness at trials on environmental risks of pollutants for legal cases within the U.S.

Dr. Fairbrother has drafted guidance documents for ecological risk assessments including the EPA’s Framework for Metals Risk Assessment, the BC Ministry of Environment guidance for implementing Tier 1 ecological risk assessments and incorporating weight of evidence practices into ecological risk assessments of contaminated sites, and participated in setting ecological soil screening and clean-up values.

While a scientist at the EPA, Dr. Fairbrother led research into the ecological risks of genetically modified crops, methods for assessing risks of nanomaterials, and some of the early guidance for field assessments of Superfund sites and effects of pesticides on birds. She researched and developed methods for assessment of chemical effects on bird immune and endocrine systems.

Dr. Fairbrother has published more than 100 peer-reviewed articles, books, and book chapters that reflect her expertise in wildlife toxicology, immunotoxicology, endocrine-disrupting chemicals, and ecological risk assessment. She has served on several National Academy of Sciences committees, most recently on the Committee on Ecological Risk Assessment under FIFRA and ESA; European Research Council review panels; and numerous other scientific boards, expert panels, and editorial boards. A veterinarian and Certified Wildlife Biologist, Dr. Fairbrother served as President of the Society of Environmental Toxicology and Chemistry, American Association of Wildlife Veterinarians, and Wildlife Disease Association. Dr. Fairbrother holds an adjunct professorship at Oregon State University, Department of Environmental and Molecular Toxicology.
Academic Credentials and Professional Honors

Ph.D., Veterinary Science, University of Wisconsin, Madison, 1985
M.S., Veterinary Science, University of Wisconsin, Madison, 1982
D.V.M., Veterinary Medicine, University of California, Davis, 1980
B.S., Wildlife and Fisheries Biology, University of California, Davis, 1976

Distinguished Service Award, Wildlife Disease Association, 2002
Gold Medal for Commendable Service, EPA, 2005

Licenses and Certifications

40-hour Hazwoper Training and Certification

Publications


Books


Book Chapters


Fairbrother A, Ankley GT, Birnbaum LS, Bradbury SP, Francis B, Gray LE, Hinton D, Johnson LL, Peterson RE, Van Derkraak G. Reproductive and developmental toxicology of contaminants in oviparous animals. pp 283–362. In: Reproductive and Developmental Effects of...


Books Edited


Selected Published Abstracts

International

Powell DE, Fairbrother A, Mackay D, Woodburn KB. Interrelationship of bioaccumulation metrics (BCF, BAF, BMF, and TMF) and how they may be incorporated into a screening-level probabilistic risk assessment. Presented at Society of Environmental Toxicology and Chemistry European Annual Meeting, Basel Switzerland, May 2014.


National (most recent 10-years)


Fairbrother A. Recommendations for ecological models to assess risks to endangered and threatened species. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Nashville, TN, November 2013


Fairbrother A, Burton GA, Klaine SJ. Toxicity of decamethylcyclopentasiloxane (D5) to aquatic and terrestrial environments. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Boston, MA, November 2011.


Morzillo AT, Fairbrother A. Effects of human activities on resident mammals within urban ecosystems. Presented at the 86th Annual Meeting of the American Society of Mammalogists meeting, Amherst, MA, June 2006.


Invited Presentations

International

Fairbrother A. 50 Years after Silent Spring. Have organophosphate and carbamate pesticides met the challenge? Seminar/Lecture: Toxicology Center, University of Saskatchewan, Saskatoon, SK, December 2012.


Fairbrother A. Genetically modified foods: Technological breakthrough or ecological nightmare? Keynote address at SETAC Asia Pacific conference, Christchurch, New Zealand, September 2003.


Fairbrother A.  Fellow of the Crown Research Institute, Wellington, New Zealand. Invited lectures to scientific staff, regulators and academics (University of NZ, Christchurch), October 2000.

Fairbrother A. Keynote speaker and invited lecturer, Zoo and Wildlife Veterinary Medicine, Continuing Education. Western Plains Zoo, Dubbo, Australia. September 1999.


National (most recent 10 years)

Invited presentation in Special Symposium: 50 Years after Silent Spring. Have Organophosphate and Carbamate Pesticides Met the Challenge? Society of Environmental Toxicology and Chemistry; Long Beach, CA, November 2012.

Seminar/Lecture: Introduction to Ecological Risk Assessment. Environmental and Molecular Toxicology Department, Oregon State University, Corvallis, OR  April 2011.


Lecture: RCRA and CERCLA: Environmental containment, contamination, and clean up. School of Veterinary Medicine, University of Illinois, March 2005.

Co-instructor: Introduction to Ecological Risk Assessment. Dept. of Fisheries and Wildlife and Dept. of Environmental and Molecular Toxicology, Oregon State University, Corvallis, OR, Winter 2003–2007.


Selected Project Experience

Conducted an invitational workshop of international bee experts to use a formal Causal Analysis approach to develop a framework for objectively diagnosing the cause(s) of declines in the health of managed honeybees. Follow up workshop reports, manuscripts, and educational materials are in preparation.
Conducted an invitational workshop of international experts to develop methods for setting ecological soil clean-up values for metals at contaminated sites in North America. Follow up workshop reports, manuscripts, and educational materials are in preparation.

Conducting an RI/FS for 150 miles of the upper Columbia River (Canadian border to the Grand Coulee Dam) and surrounding uplands to assess potential ecological risks of smelter emissions to aquatic life, plants, and wildlife. Studying contaminated sediments to ascertain bioavailable metals, conducting food-chain analyses for fish and wildlife, and evaluating soil and uplands in depositional areas to assess risks to plants and wildlife. Work is being conducted under agreement with EPA following procedures for CERCLA site assessments.

Conducting a natural resource damage assessment (NRDA) for marine wildlife in the Gulf of Mexico following the Mississippi Canyon Block 252 (BP) oil release accident in April 2010.

Providing expert reports and testimony on effects of anticoagulant rodenticides to nontarget wildlife, and the potential efficacy of reducing availability of over-the-counter consumer products based on second generation anticoagulants. In response to EPA’s draft Notice of Intent to cancel multiple products.

Provided expert reports and court room testimony on water quality and bioavailability of metals for a case involving surface water management at a closed and remediated copper mine in Wisconsin.

Provided expert reports and testimony on ecotoxicity and risk for decamethylcyclopentasiloxane (Siloxane D5) in front of the Canadian Board of Review under the Canadian Environmental Protection Act (CEPA).

Conducted a site audit and provided recommendations for wildlife pest control at a food grade packaging facility.

Conducted a Detailed Ecological Risk Assessment of the tailings management system of the Gratzburg mine, Irian Jaya, Indonesia. This included assessing risks to plants and wildlife in jungles and estuarine mangrove ecosystems through food-chain analyses, ecological function studies, and floristic composition analyses. Performed extensive plant phytotoxicity and metal uptake studies to determine risk thresholds for tropical species. A detailed report was written estimating current and future (until mine closure in 2034) risks.

Served as an Expert Advisor to Cominco and its contractors for design and conduct of a terrestrial wide-area assessment under the Contaminated Site Regulations of British Columbia. This included development of appropriate assessment endpoints, conceptual site models, sampling and analysis plans, and final risk estimates. The area encompassed the upper Columbia River Valley and associated side valleys that had been subject to past deposition from the zinc-lead smelter plume.

Conducted an Ecological Risk Assessment for 165 square miles of property surrounding the Bingham Canyon, Utah, gold mine. Work included a survey of plants and wildlife on the site,
food-chain analysis of potential metal contamination, field measurements of small-mammal populations, nesting surveys of shorebirds, and development of management options for various portions of the site. Included a probabilistic risk assessment of effects of selenium on the local populations of wading birds.

Conducted an assessment of risk to terrestrial and aquatic organisms from an abandoned mercury mine in the Ochoco Mountains, Oregon, and determined risk-based cleanup levels. This was the first risk assessment to follow the newly published Oregon Department of Environmental Quality guidelines.

Assessed the potential for risk to livestock from use of wastewater on irrigated pasture during mine closure. Selenium and thallium were identified as contaminants of concern. Plant uptake studies were conducted to refine risk estimates for thallium, both in laboratory and field situations.

Provided expert consultations on review comments relating to potential future development of pit lakes at gold mines in Nevada. Included interpretation of information on contaminants of concern, potential for bioaccumulation, and wildlife food-chain contamination.

Conducted an assessment of the potential ecological risks posed by use of copper pipes in housing in California. Specific emphasis was on amount of copper discharged to San Francisco Bay. Other areas, such as the Southern California Bight and San Diego Bay, also were assessed. Endpoints included protection of aquatic life, achievement of water quality criteria, and methods for establishing water effect ratios for specific locations.

Collated and reviewed the literature from 2005 to 2010 on environmental effects of lead, in support of the 5-year update of the U.S. national ambient air quality standards (NAAQS) for lead.

Reviewed literature and available toxicity tests for various pesticides to develop Other Scientifically Relevant Information (OSRI) in response to EPA’s request for endocrine disruptor Tier 1 screening.

Provided technical and managerial support to the organotin industry for submission of a screening information data set (SID) of information on 27 chemicals to the OECD’s High Production Volume (HPV) data call-in program. Reviewed the available literature on physical/chemical properties, environmental fate, ecotoxicity, and human health effects for all the chemicals, and entered appropriate data into the IUCLID database system. Tests were placed with contract laboratories to fill data gaps. Structure-activity relationships and chemical categories were developed to reduce the need for testing. Developed rest plans, SIARs, and dossiers for submission to the regulatory authorities.

Reviewed entire literature for effects of zinc and phthalate esters on terrestrial organisms (plants, wildlife, soil organisms). Qualified all studies for data quality and summarized the extent of the database. Provided all information in written report and electronic database of endpoints and data quality. Zinc data were used in the continent-wide ecological risk
assessment conducted by the European Union (EU) and subsequently were migrated to IUCLID for use in REACH.

Wrote a Tier I assessment and supervised the conduct of toxicity and exposure studies for registration with the U.S. Fish and Wildlife Service of a new non-toxic shot for waterfowl hunting. Successfully completed the registration process under the new regulations, which allow selected testing rather than a complete battery of tests. Information also was submitted to Environment Canada for review. Shot has been registered and successfully marketed in the U.S. for several years.

Directed studies in a fully compliant GLP laboratory following FIFRA pesticide registration guideline for mallard and bobwhite quail. Included acute, subchronic, and reproduction studies with novel chemical and biological pesticides, conducted for most of the large agrichemical companies. Additional studies included tests specifically tailored to address questions of contaminant uptake from soil, potential food aversion from chemical-treated feed, and other studies to address specific aspects of exposure of wildlife to pesticides.

Conducted and published laboratory studies with the rat as a model of the pica child to determine the uptake efficiency of petroleum hydrocarbons from soils. Soil types included aged soils, treated soils, and lampblack. Information from the study can be used in exposure equations in place of default values when estimating total uptake of PAHs from different soil types during either human or ecological risk assessments of contaminated sites.

Researched effects of estrogen supplementation in house finch breeding behavior, including mate selection, changes in plumage coloration, and reproductive output. Animals were implanted with time-release devices for continual elevation of estrogen levels, and an ELISA method for measurement of fecal/urate estrogens was adapted to the house finch to monitor changes in hormones during the breeding cycle. Used videography to assess effects on nest behaviors.

Prior Experience

Sr. Consultant and Lead for Environmental Risk Assessment and Toxicology, Parametrix, Inc., 2007–2008
Associate Director for Science, U.S. EPA, National Health and Environmental Effects Research Laboratory, Western Ecology Division, 2006–2007
Chief, Risk Characterization Branch, (Supervisory Life Scientist, hired at the GS-15 level [science promotion to Grade 15, 9/02]); U.S. EPA, National Health and Environmental Effects Research Laboratory, Western Ecology Division, Corvallis, 2002–2006
Director and Senior Ecotoxicologist, Terrestrial Ecotoxicology; Parametrix, Inc., 1999–2002
Sr. Wildlife Ecotoxicologist; Ecological Planning and Toxicology, Inc., 1994–1999
Chief, Ecotoxicology Branch, (Supervisory Ecologist, detailed at the GM-15 level), USEPA Environmental Research Laboratory, 1992–1994
Research Ecologist USEPA Environmental Research Laboratory (GS12 – GS14), 1986–1992
Courtesy Associate Professor, College of Veterinary Medicine, Oregon State University, 1987–2003
Academic Appointments

- Associate Professor (Adjunct), Department of Environmental and Molecular Toxicology, Oregon State University, 2003 - present
- Associate Professor (Adjunct), College of Veterinary Medicine, Oregon State University, 1987–2003

Advisory Appointments

- National Research Council Committee on the Design and Evaluation of Safer Chemical Substitutions
- Department of Environmental and Molecular Toxicology, Oregon State University, Departmental Review Committee, 2013
- The Institute of Environmental and Human Health, Texas Tech University, Science Advisory Board, 2005–2012
- British Columbia Science Advisory Board for Contaminated Sites, 2003–present
- International Metals Consortium Ecological Technical Advisory Panel, 1995–present
- USPEA, Endocrine Disruptor Methods Validation Committee, 2004–2006
- USEPA Risk Assessment Forum member, 2004–2007
- USGS BRD National Wildlife Health Center (NWHC) and Forest and Rangeland Ecology Science Center (FRESC), Peer Review Science Panel, 2005
- USEPA Office of Research and Development, Board of Scientific Counselors, 2001
- USEPA Science Advisory Panel (Pesticides), 2001
- Peer Review Panel for Ecotoxicity Threshold Values, Superfund Program, US Environmental Protection Agency, 1995
- US Environmental Protection Agency Peer Review Panel, Ecological Risk Assessment Guidelines, 1995
• National Research Council Committee Member, Use of Animals as Indicators of Environmental Health Hazards, 1988–1991

Editorships and Editorial Review Boards

Editorial Boards

• *Human and Ecological Risk Assessment*, 2004–present
• *Journal of Wildlife Diseases*, 1998–present
• *Risk Analysis*, 2001–present
• *Ecotoxicology*, 2009–present
• *Emerging Topics in Ecotoxicology* (book series), 2008–present
• *Bulletin of Environmental Contamination and Toxicology*, 2013

Associate Editor

• *Chemosphere* (Risk Assessment section), 2003–2005
• *Ecotoxicology*, 1995–present

Guest Editor

• Seminars in Avian and Exotic Pet Medicine *Toxicology* Vol 8, Jan 1999
• Fact Sheets on Environmental Risk Assessment, [www.icmm.org](http://www.icmm.org), 2001–2002
• *Ecological Applications* special issue on mercury in Clear Lake, CA, 2006–2007

Peer Reviewer (in addition to above journals)

• *Archives of Environmental Contamination and Toxicology*
• *Ecological Applications*
• *Ecotoxicology and Environmental Safety*
• *Environmental Science and Technology*
• *Risk Analysis*
• *Etc.*

Professional Affiliations

• American Veterinary Medical Association—AVMA
• American Association of Wildlife Veterinarians—AAWV
  – President, 1991–1993
• Society of Environmental Toxicology and Chemistry—SETAC
  – President SETAC North America, 2002–2003
• Society for Risk Analysis—SRA
• Wildlife Disease Association—WDA
  – President, 1995–1997