

30th VERTEBRATE PEST CONFERENCE

March 7-10, 2022

Reno, Nevada



30th Vertebrate Pest Conference, March 7-10, 2022-Reno, NV

Conference Chair:

Roger Baldwin

Program Chair:

Niamh Quinn

Includes special symposia:

- **Managing Hooved Animals**
- **Wildlife Diseases/Zoonoses**
- **Rodenticide Environmental Fate and Nontarget Effects**

Organized by:

The Vertebrate Pest Council

Property Map

Casino Level

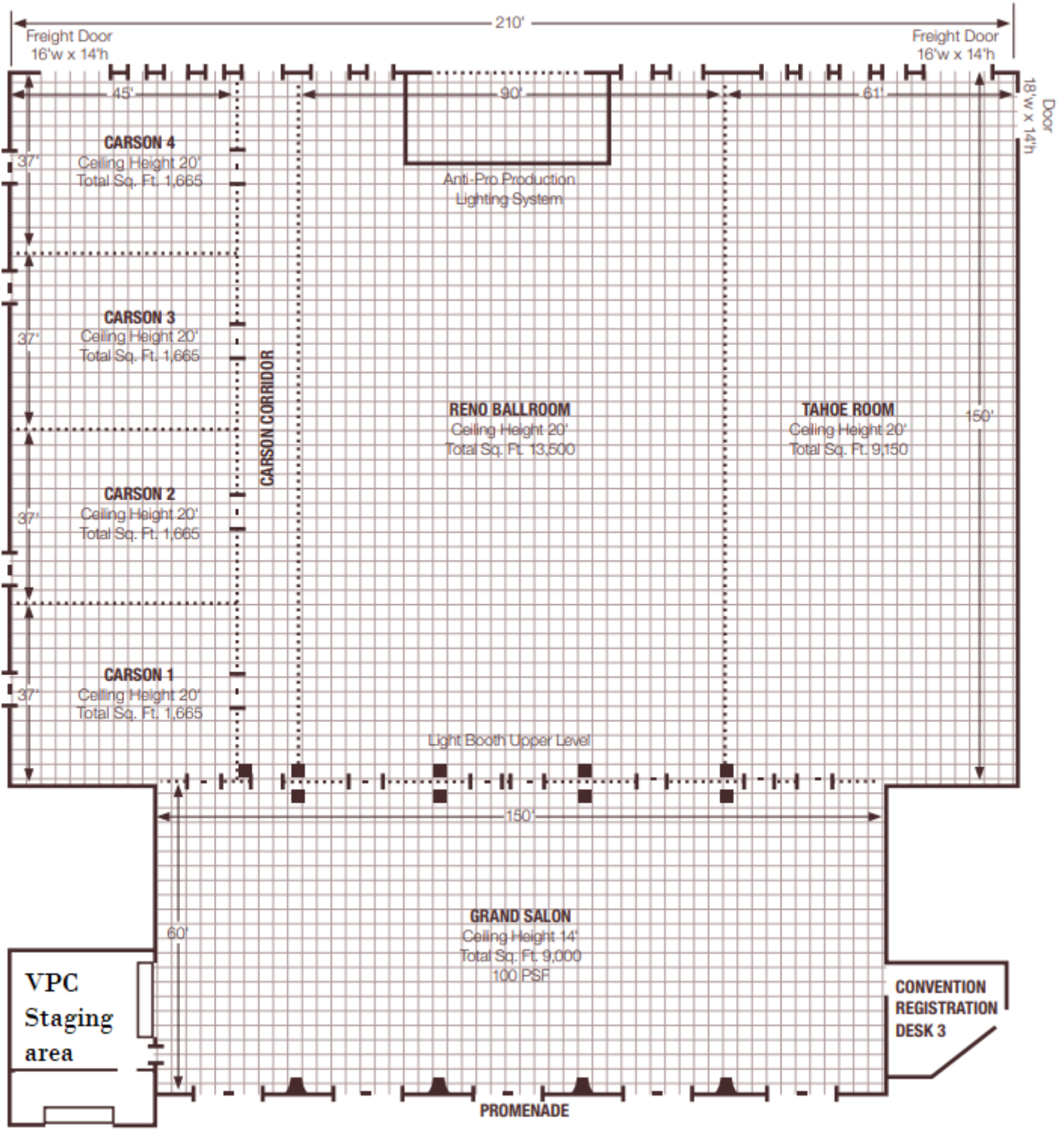


Spa Level



Executive Level





WELCOME

Welcome to the 30th Vertebrate Pest Conference. We hope you find the conference to be enjoyable and educational. We are excited this year to present the Walter E. 'Howdy' Howard Lifetime Achievement Award for Excellence in Vertebrate Pest Management to honor those that have made significant contributions towards the advancement of the field.

We have worked over the years to keep this educational Conference the best of its kind. We welcome your comments (good and bad) concerning it. We are always looking for potential Conference speakers and would appreciate your suggestions for possible speakers or program topics. Contact the chairperson, Roger Baldwin, (E-mail: rabaldwin@ucdavis.edu).

CONFERENCE PROCEEDINGS

Print-on-Demand copies of the *Proceedings* of the 29th Vertebrate Pest Conference (2020) are now available at **Amazon.com** (\$8.99 + tax and shipping); at the website, simply search for "Vertebrate Pest Conference."

Individual papers from past Vertebrate Pest Conference *Proceedings*, Volume 1 (1962) through Volume 29 (2020), are available open-access and can be downloaded from the following website: https://escholarship.org/uc/vertebrate_pest_conference.

ATTENTION TO PRESENTERS

Check in with your session chairperson at the beginning of your session and introduce yourself. Please be careful with your time and respectful of the session chairperson and your fellow speakers. Speakers will have 25 minutes to be introduced, present their talks, and field questions. Session chairpersons will keep speakers on time to ensure people attending concurrent sessions can hear papers presented at their published times.

Loading Presentations: A VPC representative or volunteer will be available to load your presentation in preparation for your session. Please bring your presentation loaded on portable storage device (e.g. thumb-drive) to facilitate this process. We will transfer your presentation to our computer and return your storage device to you.

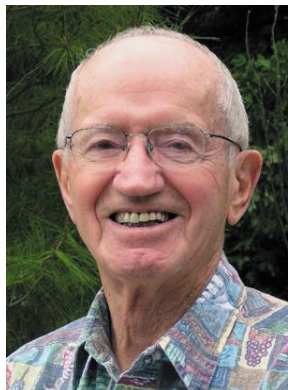
SPEAKERS' BREAKFAST

There will be a breakfast for speakers on Wednesday morning from 6:30 to 8:30 in the McKinley Room. This breakfast is only for speakers and poster presenters

Walter E. ‘Howdy’ Howard Lifetime Achievement Award for Excellence in Vertebrate Pest Management

The Vertebrate Pest Council is pleased to announce the presentation of the Walter E. “Howdy” Howard Lifetime Achievement Award. This award has been established to acknowledge the tremendous lifetime contributions of individuals in the Vertebrate Pest Management profession.

Walter E. ‘Howdy’ Howard



The Walter E. “Howdy” Howard Lifetime Achievement Award is named after a true pioneer and pillar in the vertebrate pest control profession. Born in 1917, Howdy’s love for biology began as a young child. He graduated from U.C. Berkeley, served three years during WWII, primarily focusing on disease and parasite control, and completed his M.S. and Ph.D. at the University of Michigan. He joined the faculty at U.C. Davis in 1947 as professor of Wildlife Ecology. During his lifelong tenure at Davis, he developed the field of vertebrate ecology including vertebrate pest control, making UC Davis a premier international research and teaching institute in this field. His research focused on rodents impacting agriculture and public health, predators especially coyotes, and the politics of dealing with wildlife-human conflicts. He was committed to making state and federal agencies good stewards of wildlife populations and their habitats, and that the political structure ensures wildlife populations and humans coexist. Howdy is especially known for his perspective on the balance of nature and his direct challenge

of the arguments posed by groups who are opposed to controlling wildlife populations. Howdy’s impact on our profession and personal legacy live on today through the 44 Ph.D. and M.S. students he advised and mentored at U.C. Davis and the countless professionals influenced by his personal interactions and writing. Howdy passed away in 2018 at the age of 101. It is with great honor that we name this award after Howdy.

Rex O. Baker

Rex was broadly recognized as an authority on vertebrate pest management for decades, not only in California, but nationally as well. Rex started his career in the regulatory side of the profession, where he was hired as a Deputy Agricultural Commissioner in San Diego County. From there, he moved to Cal Poly Pomona as a Professor where he was instrumental in the development and implementation of the Agricultural Biology major, and subsequently became the director of the university’s Vertebrate Integrated Pest Management Research Program. Throughout his tenure at Cal Poly Pomona, Rex provided direct mentorship and training to innumerable students in the vertebrate pest management discipline, many of whom currently serve in leadership roles in the regulatory, production, and commercial sides of pest control. In 2001, Rex received the College of Agriculture’s Distinguished Alumni award from Cal Poly. Throughout his career, Rex made a number of significant contributions in the areas of research, product development (including a patented rodent bait station), and directly assisted in the registration of wildlife management products. Rex also actively participated in the Vertebrate Pest Council for almost four decades, where he served in almost all rolls including as Chair of the 18th Vertebrate Pest Conference. Rex authored a number of significant publications including some of the most cited papers in the *Prevention and Control of Wildlife Damage* handbook and the journal *Human-Wildlife Interactions*. He also authored 8 papers in the Proceedings of the Vertebrate Pest Conference. Rex passed away in 2020, but his positive attitude and accomplishments continue to inspire the next generation of pest control professionals.



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PERSON!*

REGISTRATION OPENS AUGUST 2022



Conference At-A-Glance

Monday, March 7

Optional Field Trip 8:00 AM – 4:00 PM
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Tuesday, March 8

Opening Plenary Session 9:00 AM – 12:00 PM

Lunch (*on your own*)
Posters and Commercial Exhibits open – 1:15

<i>Concurrent Session:</i> Rodent Management 1:20 PM – 5:00 PM	<i>Symposium:</i> Wildlife Diseases/Zoonoses 1:20 PM – 4:35 PM
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5:30 No-Host Welcoming Social

Wednesday, March 9

<i>Symposium:</i> Rodenticide Environmental Fate and Nontarget Effects 8:10 AM – 12:00 PM	<i>Symposium:</i> Management of Hooved Animals 8:10 AM – 12:00 PM
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Lunch (*on your own*)

<i>Symposium:</i> Rodenticide Environmental Fate and Nontarget Effects 1:20 PM – 5:00 PM	<i>Concurrent Session:</i> General Session 1:20 PM – 3:05 PM
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6:30 PM: Hors d'oeuvres, Poster Session, and Vendors' Forum

Thursday, March 10

<i>Concurrent Session:</i> Vertebrate Pesticides 8:10 AM – 11:00 AM	<i>Concurrent Session:</i> General Session 8:10 AM – 11:00 AM
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CONTINUING EDUCATION

Attendees seeking Continuing Education credit must sign in and out at the event registration desk. All credits are approximations and are dependent upon your attendance.

California Department of Pesticide Regulation*:

3/7- Field trip- 3.5 hours Other
3/8- Plenary session- 1.75 hours Other
3/8- Rodent Management session- 3.75 hours Other
3/8- Wildlife Diseases/Zoonoses session- 2.25 hours Other
3/9- General session- 1.25 hours Other
3/9- Management of Hooved Animals session- 2.0 hours Other
3/9- Rodenticide Environmental Fate and Nontarget Effects session (AM)- 3.0 hours Other
3/9- Rodenticide Environmental Fate and Nontarget Effects session (PM)- 3.25 hours Other
3/10- General session- 2.0 hours Other
3/10- Vertebrate Pesticides session- 3.0 hours Other
**All hours were awaiting approval at time of publication*

Nevada Department of Agriculture

Field Trip- 3.5 hours
Day 1 Plenary session- 2.0 hours
Day 1 Rodent Management session- 4.0 hours
Day 1 Wildlife Diseases/Zoonoses session- 2.0 hours
Day 2 Management of Hooved animals- 2.0 hours
Day 2 Rodenticide Environmental Fate and Nontarget Effects AM session- 3.5 hours
Day 2 General session- 1.5 hours
Day 2 Rodenticide Environmental Fate and Nontarget Effects PM session- 3.0 hours
Day 3 General session- 3.0 hours
Day 3 Vertebrate Pesticides session- 3.0 hours

California Department of Public Health:

Day 1: (field trip) 2.25 Category D
Day 2: 0.25 Category C and 1.5 Category D.
Day 3: 1.5 Category D
Day 4: No hours available

CONFERENCE FIELD TRIP (Optional)

The Conference begins with an optional full-day field trip on Monday, March 7. The field trip departs from the Grand Sierra Resort and Casino at 8:00 AM. The field trip will include a tour of the surrounding area with many human-wildlife conflicts highlighted along the way. A lunch will be provided (included in cost). Buses will return to the hotel by approximately 4:00 PM.

Those who have pre-registered for the field trip should board the chartered bus in front of the hotel at 8:00 AM on Monday morning, March 7. Warm clothing and rain gear are recommended.

Tuesday, March 8 AM

PLENARY

- 9:00 **Conference Welcome and Overview**
Roger A. Baldwin, Vertebrate Pest Conference Chair
- 9:20 **Keynote Address**
Jens Jacob, Julius Kühn-Institute, Federal Research Centre for Cultivated Plants, Münster, Germany
- 10:05 **Lifetime Achievement Award**
Roger A. Baldwin, Vertebrate Pest Conference Chair
- 10:25 **Break**
- 10:45 **Development of a New Immunocontraceptive for Use in Feral Horses**
Jason Bruemmer, USDA APHIS WS National Wildlife Research Center, CO
- 11:10 **Twenty Years of Big-Brown Bat Rabies Virus Cross Species Transmission in Flagstaff, Arizona, 2001-2021**
David L. Bergman, USDA APHIS Wildlife Services, AZ
- 11:35 **Anticoagulant Rodenticide Exposure in Red Kites (*Milvus milvus*): Regulatory Changes and Analytical Progress
Change the Picture!**
Philippe Berny, Vetagro Sup - Toxicology, Marcy, France
- 12:00 **Session Close**

Tuesday, March 8 (PM)

CONCURRENT SESSION: RODENT MANAGEMENT

- 1:20 **Session Welcome: Michael Mooney, Alameda County Mosquito Vector Control Services District, Session Chair**
- 1:25 **Influence of California Ground Squirrels on Forage Availability for Ranching Operations**
Devii Rao, University of California Cooperative Extension, Hollister, CA
- 1:50 **Evaluating the Use of Barn Owl Nest Boxes for Rodent Pest Control in Winegrape Vineyards in Napa Valley**
Ashley Hansen, Humboldt State University, Arcata, CA
- 2:15 **Improving Efficiency of Prairie Dog Surveys Using a Small Copter Drone**
Aaron Shiels, USDA/APHIS/Wildlife Services, National Wildlife Research Center, Fort Collins, CO
- 2:40 **Abert's Squirrel Management in Support of Endangered Mount Graham Red Squirrel Recovery in Arizona**
Aaron Morehead, USDA/APHIS/Wildlife Services, Phoenix, AZ
- 3:05 **Break**
- 3:20 **Continuing Field Efficacy of Norbormide Against Both *Rattus rattus* (Ship Rats) and *Rattus norvegicus* (Norway Rats)**
Lee Shapiro, Boffa Miskell, Lincoln, New Zealand
- 3:45 **An Assessment of Quantitative Indexing Tools and Movement Patterns in Invasive Roof Rats in Citrus Orchards**
Roger A. Baldwin, Department of Wildlife, Fish, and Conservation Biology-University of California, Davis, CA
- 4:10 **Managing Roof Rats in Citrus Orchards: Failures and Potential Successes**
Ryan Meinerz, Department of Wildlife, Fish, and Conservation Biology-University of California, Davis, CA
- 4:35 **New Baits to Control Blacklegged Ticks Feeding on Two Host Species: Lyme Disease Implications**
David Poche, Genesis Labs, Inc., Wellington, CO
- 5:00 **Session Close**

Tuesday, March 8 (PM)

SYMPOSIUM: WILDLIFE DISEASES/ZOONOSES

- 1:20 **Session Welcome: Nicki Frey, Utah State University, Session Chair**
- 1:25 **Sarcoptic Mange in Urban Kit Foxes: Potential for Cross-Species Transmission**
Erica C. Kelly, California State University, Stanislaus, CA
- 1:50 **Surveillance for Snake Fungal Disease in California's Free-Ranging Snakes**
Raquel Elander, University of California, Davis, CA
- 2:15 **Update of Wildlife Diseases in Nevada**
Nate LaHue, Nevada Department of Wildlife, Reno, NV

- 2:40 **California's Chronic Wasting Disease Surveillance Program**
Alex Heeren, California Department of Fish and Wildlife, Rancho Cordova, CA
- 3:05 **Break**
- 3:20 **Investigating Protozoal Parasites as Causes of Neurologic Disease in American Black Bears (*Ursus americanus*) that Contribute to Human-Wildlife Conflict**
Devinn Sinnott, University of California, Davis, CA
- 3:45 **Detection of *Toxoplasma gondii* in Feral Cats in Central Coastal California**
Sophie Zhu, Department of Pathology, Microbiology, and Immunology, School of Veterinary Medicine, University of California, Davis, CA
- 4:10 **Disease Surveillance of Invasive Nutria (*Myocastor coypus*) Inhabiting Wetlands in California's Central Valley**
Jane Riner, School of Veterinary Medicine, University of California, Davis, CA
- 4:35 **Session Close**

Wednesday, March 9 (AM)

SYMPOSIUM: MANAGEMENT OF HOOVED ANIMALS

- 8:10 **Session Welcome: Laura Snell, University of California Cooperative Extension, Session Chair**
- 8:15 **What is a Wild Horse?**
Tolani Francisco, USDA Forest Service, Albuquerque, NM
- 8:40 **Opportunities for Local Partnerships in Managing Free-Roaming Equids**
Laura K. Snell, University of California Cooperative Extension, Alturas, CA
- 9:05 **Fertility Control Options for Free-Ranging Horse Populations Highlighting Spayvac®-Equid**
Ursula Bechert, University of Pennsylvania, Philadelphia, PA
- 9:30 **Knowledge and Opinions of Federal Management to Control Free-Roaming Horse Populations in the U.S.**
Nicki Frey, Utah State University Extension, Berryman Institute, Cedar City, UT
- 9:55 **Break**
- 10:10 **Are Mountain Lions Really Eating Feral Horses?**
Pat Jackson, Nevada Department of Wildlife, Reno, NV
- 10:35 **Evidence for Irruptive Fluctuation in Axis Deer of Hawai'i**
Steven C. Hess, USDA APHIS Wildlife Services, National Wildlife Research Center, Hawai'i Field Station, Hilo, HI
- 11:00 **Immobilization Efficacy of a Conducted Electrical Weapon in Captive White-Tailed Deer**
Patrick J. Grunwald, University of Georgia School of Forestry and Natural Resources, Athens, GA

11:35 **Status of the Exotic Mule Deer Population on Catalina Island, California, Based on Annual Spotlight Counts**
Paul Stapp, California State University, Fullerton, CA

12:00 **Session Close**

Wednesday, March 9 (AM)

SYMPOSIUM: RODENTICIDE ENVIRONMENTAL FATE AND NONTARGET EFFECTS

8:10 **Session Welcome: Katie Swift, Liphatech Inc., Session Chair**

8:15 **Anticoagulant Rodenticide Hazards to Predatory Birds: Sublethal Effects, Interpretation of Tissue Residues, and Toxicity Thresholds**
Barnett A. Rattner, Eastern Ecological Science Center, U.S. Geological Survey, Department of the Interior, Beltsville, MD

8:40 **Investigating the Pathways of Rodenticides in Urban Carnivores**
Niamh Quinn, University of California Cooperative Extension, Irvine, CA

9:05 **Use of Anticoagulant Rodenticides on Farms – Non-Target Exposure and Potential Mitigation**
Jens Jacob, Julius Kühn-Institute, Federal Research Centre for Cultivated Plants, Münster, Germany

9:30 **Understanding Anticoagulant Rodenticide Impacts on Demography of a Wild, Free-Living Raptor Population in Landscapes Along an Urban Gradient in Western North America: Preliminary Findings and a Status Update**
Dave Oleyar, HawkWatch International, Salt Lake City, UT

9:55 **Break**

10:10 **Exposure of Urban Coyotes to Anticoagulant Rodenticides in Southern California: Sub-Lethal Effects and Environmental Correlates**
Paul Stapp, California State University Fullerton, CA

10:35 **Investigation Between Anticoagulant Rodenticides and Non-Target Exposure in Breeding Barn Owls**
Emily Phillips, University of California, Davis, CA

11:00 **Analytical Challenges to Monitor Anticoagulant Exposure or Poisoning in Animals: Lessons from the Past and New Developments**
Philippe Berny, Toxicology, Vetagro Sup, Marcy l'etoile, France

11:35 **Thirty Years of Rodenticide Residue Analysis: How Low is Low Enough?**
David A. Goldade, USDA/APHIS/Wildlife Services, National Wildlife Research Center, Fort Collins, CO

12:00 **Session Close**

Wednesday, March 9 (PM)

SYMPOSIUM: RODENTICIDE ENVIRONMENTAL FATE AND NONTARGET EFFECTS

- 1:20 **Session Welcome: Niamh Quinn, University of California Cooperative Extension, Session Chair**
- 1:25 **Human Exposure to Superwarfarin Rodenticides: Methods of Detection and Treatment**
Douglas Feinstein, University of Illinois; Jesse Brown VA Medical Center, Chicago, IL
- 1:50 **Chiral Liquid Chromatography-Tandem Mass Spectrometric Analysis of Superwarfarin Rodenticide Stereoisomers – Bromadiolone, Difenacoum and Brodifacoum – in Human Plasma**
Richard B. van Breemen, Oregon State University, Corvallis, OR
- 2:15 **Analyzing for Anticoagulant Rodenticides in Animal Tissue**
Michael Filigenzi, California Animal Health and Food Safety Lab, UC Davis, CA
- 2:40 **A Validated LC-ESI-MS/MS Method for Quantifying Multiple Rodenticides in Microscale Samples of American Kestrel Liver, Feces, and Whole Blood**
Steven F. Volker, USDA/APHIS/Wildlife Services, National Wildlife Research Center, Fort Collins, CO
- 3:05 **Break**
- 3:20 **Anticoagulant Rodenticide Contamination of Terrestrial Birds of Prey from Western Canada: Patterns and Trends, 1988 – 2018**
Sofi Hindmarch, Science & Technology Branch, Environment and Climate Change Canada, Delta, British Columbia, Canada
- 3:45 **Diphacinone and Cholecalciferol (D+C) As A Low Residue Rodenticide**
Charles Eason, Lincoln University, Lincoln, New Zealand
- 4:10 **Identification of *Rattus tanezumi* and Y25F Mutations in The Vkorc1 Gene of *Rattus* Species in Orange County, California**
Daisey Rangel, Orange County Mosquito and Vector Control District, Garden Grove, CA
- 4:35 **Panel Discussion**
- 5:00 **Session Close**

Wednesday, March 9 (PM)

CONCURRENT SESSION: GENERAL SESSION

- 1:20 **Session Welcome: Dirk Van Vuren, University of California, Davis, Session Chair**
- 1:25 **The Moving Target of Feral Pig Management**
Aaron Sumrall, Field Engine Wildlife Research/Pig Brig, Bay City, TX
- 1:50 **Assessment and Control of Wild Pigs at Hakalau Forest National Wildlife Refuge: Efforts in Progress**
Kurt VerCauteren, USDA/APHIS/Wildlife Services, National Wildlife Research Center, Fort Collins, CO

- 2:15 **Pest Friends, a Board Game Simulation of Pest Management**
Grant D. Loomis, University of Idaho, Hailey, ID
- 2:40 **Small Rodent Communities and Their Associated Damage to Wheat-Groundnut Agriculture Systems**
Nadeem Munawar, Department of Wildlife Management, PMAS-Arid Agriculture University, Rawalpindi, Pakistan
- 3:05 **Break and Session Close**

Thursday, March 10 (AM)

CONCURRENT SESSION: VERTEBRATE PESTICIDES

- 8:10 **Session Welcome: Mike Taber, Wildlife Control Technology, Session Chair**
- 8:15 **A 2021 Review of Sodium Fluoroacetate for Conservation and Protecting Endangered Species**
Charles Eason, Lincoln University, Lincoln, New Zealand
- 8:40 **Efficacy of BurrowRx to Treat Black-tailed Prairie Dogs (*Cynomys ludovicianus*) in Montana: A Pilot Study**
Stephen M. Vantassel, Montana Department of Agriculture, Lewiston, MT
- 9:05 **Development of a New Coyote Toxicant**
Katherine Horak, USDA/APHIS/Wildlife Services, National Wildlife Research Center, Fort Collins, CO
- 9:30 **The Path to U.S. National Registration of a Toxicant Product for the Control of the Small Indian Mongoose**
Carmen C. Antaky, USDA, APHIS, WS, National Wildlife Research Center, Hawai'i Field Station, Hilo, HI
- 9:55 **Break**
- 10:10 **Rodent Contraceptives in Poultry Farms**
Courtney Ray, SenesTech, Inc., Phoenix, AZ
- 10:35 **The Economic, Social and Political Impact of the California Ecosystems Protection Act**
Dr. Loretta Mayer, FYXX Foundation, Flagstaff, AZ
- 11:00 **Session Close**

Thursday, March 10 (AM)

CONCURRENT SESSION: GENERAL SESSION

- 8:10 **Session Welcome: Dan Macon, University of California Cooperative Extension, Session Chair**
- 8:15 **Can Nest Boxes in Napa Valley Winegrape Vineyards Sustain a Local Population of American Barn Owls (*Tyto furcata*)?**
Jaime E. Carlino, Department of Wildlife, Humboldt State University, Arcata, CA

- 8:40 **Mainland Eradication of the Invasive Raccoon Dog (*Nyctereutes procyonoides*) and the Evolution of a National Task Force for Invasive Alien Species**
P-A Åhlén, Swedish Association for Hunting and Wildlife Management, Ånäset, Sweden
- 9:05 **The Wildlife Affordances of Urban Infrastructure: Towards A Multispecies Commons**
Chase Niesner, The Institute of the Environment and Sustainability, University of California, Los Angeles, CA
- 9:30 **The Red Queen and the Brown Treesnake: Moving Targets for Management of One of the World's Most Harmful Invasive Reptiles**
Shane R. Siers, USDA Wildlife Services National Wildlife Research Center, Barrigada, Guam
- 9:55 **Break**
- 10:10 **Free-Roaming Cat Management: Be Careful What You Wish For**
Peter J. Wolf, Best Friends Animal Society, Kanab, UT
- 10:35 **Decision-Making for Foraging in Response to Auditory Stimuli in Wild-Caught Jungle Crows**
Masaki Shirai, Central Research Institute of Electric Power Industry, Abiko, Japan
- 11:00 **Session Close**

POSTER SESSION

Wednesday, March 9 (6:30-8:00 PM)

Location: Grand Salon

Session Chair: Carolyn Whitesell, University of California Cooperative Extension

Livestock Mortality Composting to Mitigate Livestock Predator Interactions

Laura Snell, University of California Cooperative Extension, Alturas, CA

Evaluating and Implementing Practices to Control the Piute Ground Squirrel Epidemic in Southern Utah

Mark Nelson, Utah State University Extension, Beaver, UT

Determining Effective Attractants for Roof Rats in Citrus Orchards

Kallista N. Wales, Animal Biology Major, University of California, Davis, CA

**Commercial Exhibits
(Tuesday-Thursday)**

Automatic Trap Company

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RCO International

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30th VERTEBRATE PEST CONFERENCE

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Dirk Van Vuren, University of California, Davis
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Plan to attend the
31st Vertebrate Pest Conference
March 11 – 14, 2024

Monterey Marriot
Monterey, California

Notes: