

32nd VERTEBRATE PEST CONFERENCE

March 2-5, 2026
San Diego, California

THE VERTEBRATE PEST COUNCIL



Conference Chair:
Nicki Frey

Program Chair:
Laura Snell

Abstract Book

Organized by:
The Vertebrate Pest Council

Conference At-A-Glance: Tentative Schedule

Monday, March 2

Optional Field Trip <i>Sponsored by CATCHMASTER</i> 7:00 AM – 4:30 PM

Tuesday, March 3

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

Lunch (on your own)

Posters and Commercial Exhibits open – 1:15 PM

<i>Symposium:</i> Commensal Rodents at the Global Crossroads 1:20 PM – 5:00 PM	<i>Symposium:</i> Advancing Fertility Control for Vertebrate Pests: Research, Innovation, and Implementation 1:20 PM – 5:00 PM
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5:30 PM No-Host Welcoming Social

Wednesday, March 4

Speaker's Breakfast 6:30-8:30 AM

<i>Symposium:</i> Commensal Rodents at the Global Crossroads 8:10 AM – 12:00 PM	<i>Symposium:</i> New Frontiers in Managing Wild Pigs 8:10 AM – 12:00 PM
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Lunch (on your own)

<i>Symposium:</i> Commensal Rodents at the Global Crossroads 1:20 PM – 5:00 PM	<i>Concurrent Session:</i> General Session 1:20 PM – 5:00 PM
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Workshop: Botstiber Fertility Control Workshop

1:30-5:00 Room Sierra 5/6

6:30 PM: Hors d'oeuvres, Poster Session, and Vendors' Forum Salon E

Sponsored by USDA-APHIS - Wildlife Services

Thursday, March 5

<i>Symposium:</i> Commensal and Field Rodent Management 8:10 AM – 12:00 AM	<i>Symposium:</i> Working Dogs and Wildlife 8:10 AM – 11:35 AM
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Lunch (on your own)

<i>Session:</i> Other Rodent Management 1:20 PM – 3:05 PM
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Tuesday, March 3 (AM)
PLENARY

9:20 **Keynote Address “Click bait solutions for rat management won’t save us, but implementation science might”**
Kaylee Byers, School of Population and Public Health, University of British Columbia; Faculty of Health Sciences, Simon Fraser University; Canadian Wildlife Health Cooperative

For centuries, cities have struggled to manage rats and the harms associated with them. From ancient traps to modern, Bluetooth-enabled devices, humans have continually sought better ways to detect, track, and target rat infestations. While these technological advances have improved our capacity to respond, a growing body of research now recognizes urban rat management as a “wicked problem.” Wicked problems have no single solution; instead, they require coordinated, multi-level responses that address the systems in which the problem exists. This means moving away from targeting rats themselves, to managing the systems that allow them to thrive. To do this, decades of urban rat research call for ecologically-based, proactive management—so why haven’t we changed course? To make meaningful progress, rat management must go beyond smarter tools to smarter implementation. Originating in healthcare and public health spaces, Implementation Science addresses the gap between when evidence is derived and when it is put into practice. Rather than asking, “Does an intervention like ecological management work?” it asks, “What are the barriers and facilitators to putting ecological management into action?” In this talk, we argue that investing in Implementation Science is a necessary next step in the evolution of urban rat management. We will explore how the theories, models, and frameworks used in Implementation Science can account for human behavior, organizational constraints, and policy contexts to explain why proven approaches often fail to translate into routine practice. We will highlight how context-specific evaluations of local programs can reveal the factors that support adoption and sustained implementation, which will offer a pathway to move towards scalable impact. Ultimately, if cities aim to achieve lasting reductions in urban rat-associated harms, the next innovation must be how we implement what we already know works.

10:45 **The effectiveness of combination lures and sustained trapping in attempting to achieve the localized elimination of brushtail possums on the New Zealand mainland.**

Professor James Ross¹, Mohamed Safeer¹, Jean-Louise Roberts¹

¹Lincoln University, Lincoln, Canterbury, New Zealand

Before humans settled in NZ, there were no terrestrial mammals; therefore, the local species evolved without mammalian predators. This lack of coevolution has resulted in native species populations declining at alarming rates, and many may be facing extinction on the NZ mainland, especially large-bodied endemic birds. In response to this problem, private investors (supported by the NZ government) developed a program to eradicate the key mammal predators (possums, rats, and stoats) on the NZ mainland by 2050 (PFNZ2050). As a result, control efforts have significantly expanded over the past decade, and there are now 17 PFNZ2050 landscape projects covering 757,000 ha. Traditionally, ground-based possum control has relied on single-kill traps and food-based lures. However, PFNZ2050 has developed into a thriving industry with expertise in developing and manufacturing species-specific attractants. Previous research has examined possum responses to audio, visual, and social lures in captivity. Recent field research, conducted at both high and low possum densities, has demonstrated that a combination of audio, visual, and social lures significantly increases trap capture rates. With the drive to PFNZ2050, it is also important to develop control strategies capable of removing all individuals at a specific location, termed “local elimination”. Re-invasions are then managed using geophysical barriers or trapping buffers. Currently, the only ground-based tool capable of local elimination is brodifacoum, applied on a 100x100 m bait-station grid. Research has demonstrated that this technique will remove virtually all individuals within 10 weeks of continuous baiting. Current research is assessing the ability to achieve a similar result using a more widely spaced trapping grid using self-resetting, multi-kill traps. At the conference, I will present the final results from the combination lure research. I will also present preliminary field-trial results comparing the effectiveness of brodifacoum baiting versus trapping for achieving local elimination at the landscape scale.

11:10 **From mice to elephants: tools and trends in the wildlife fertility control landscape**

Giovanna Massei, Botstiber Institute for Wildlife Fertility Control, Media, PA

Human-wildlife conflicts are growing worldwide, often associated with “overabundant” wildlife. In parallel, public attitudes to wildlife are shifting from the traditional “pest management” to “human-wildlife conflicts resolution” and lately to “coexistence”. This is particularly relevant where human densities are relatively high and where attitudes to wildlife control are driving interest towards non-lethal methods for mitigating human-wildlife conflicts. Public opposition to lethal methods is exemplified by current bans or restrictions for use of anticoagulant rodenticides, recently implemented in Canada, the USA and in some European countries, which focused attention on more environmentally friendly alternatives of rodent control. In this context, fertility control is often advocated as an alternative approach to reduce human-wildlife conflicts for native and non-native wildlife, in both rural and urban areas and for a wide range of species. The first part of this presentation will illustrate case studies where fertility control has been implemented or considered as complementary to other population management methods. The second part will highlight the progress made in practical applications of contraceptives for wildlife and emphasize reasons for investing in research in this area. The third part of the presentation will discuss opportunities and challenges to meet the demand for effective and safe alternatives to lethal control for managing overabundant wildlife in the 21st century.

11:35 **Forty-five years of removal campaigns for feral ungulates reveal strategies for success and future directions**

Nathan P. Snow¹, Keely J. Kohen¹, Ingrid A. Messer¹, Abigail Pagels¹, Seth M. Cook¹, Scott Beckerman¹, Travis Guerrant¹, Kurt C. VerCauteren¹, Kim M. Pepin¹

¹USDA National Wildlife Research Center, Fort Collins, CO

Feral or invasive ungulates (hereafter: feral ungulates) exist worldwide, and their ability to thrive threatens biodiversity, degrades ecosystems, and causes damage to agriculture and properties. Strategies for removing feral ungulates from their introduced insular and mainland ranges have varied greatly, successes have been difficult, and the need is increasing. We reviewed published scientific literature on feral ungulate eradication and maximum control campaigns during 1978–2023 to identify practices that led to greater success. Of 54 campaigns, 32 (59%) reported success. Most campaigns focused on feral swine (61%; *Sus scrofa*) or feral goats (24%; *Capra hircus*). The average duration of a campaign was 61 months and cost an average of \$1.9 m (\$USD 2024) or \$636/km²/month. The most important components for success included ensuring adequate funding was secured for the campaign (\$0.5–1 million/km² is recommended) and population recovery or reinvasion were minimized. The frequency of campaigns has increased during the last 45 years; however, the areas worked (km²), monthly durations, removal techniques used, funding, and ultimately the rates of success have not changed. A lack of increasing success for larger and more complex campaigns indicated that modernization of technologies for population control has been minimal, and larger breakthroughs are needed. Safe and effective toxicants and sterilants may provide those advances if developed. Lessons learned from campaigns indicate that pilot testing control methods prior to initiating full campaigns may help to alleviate uncertainties, produce more reliable plans, and help inform the biology of the animals being targeted for removal.

Tuesday, March 3 (PM)

SYMPOSIUM: COMMENSAL RODENTS AT THE GLOBAL CROSSROADS

1:25 **Assessing anticoagulant rodenticide resistance in *Rattus* spp. across urban and agricultural landscapes in California**

Niamh Quinn¹, Katherine Horak², Antionette Piaggio², Gabriela Guzman¹, Roger Baldwin³, Catherine Swift⁴,

¹University of California Agriculture and Natural Resources, Irvine, CA, USA

²USDA WS National Wildlife Research Center Fort Collins, CO

³Department of Wildlife, Fish, and Conservation Biology, University of California-Davis, Davis, CA

⁴Liphatech Inc., Milwaukee, WI

Roof rats (*Rattus rattus*) are emerging as a significant pest in California’s high-value tree and nut crops, causing extensive damage through fruit predation, girdling, and contamination that elevates food-safety risks. At the same

time, infestations in urban settings continue to challenge vector control districts and pest management professionals. The first-generation anticoagulant rodenticides (FGARs) chlorophacinone, diphacinone, and warfarin are relied upon for both structural and agricultural rodent control raising concerns about selective pressures for the potential emergence or spread of anticoagulant resistance in California rat populations. Despite these risks, the United States still lacks significant data about the prevalence of resistance and the genetic mutations associated with reduced sensitivity to anticoagulant rodenticides. To begin gaining an understanding of the prevalence and functional significance of resistance-associated mutations in the VKORC1 gene, we collected *Rattus* spp. from urban and agricultural regions throughout California. Tail tissue from snap- and live-trapped rats was sequenced to identify single nucleotide polymorphisms (SNPs) reported in the literature to be associated with anticoagulant resistance. For populations where putative resistance mutations occur, we are conducting in-vitro assays to quantify VKOR activity and evaluate metabolic resistance to anticoagulant compounds. These functional data will help determine if identified mutations alter susceptibility to anticoagulant rodenticide active ingredients registered in the US. Results from this work will inform the development of evidence-based resistance management strategies for both agricultural and structural rodenticide applicators. Understanding the current distribution and functional significance of anticoagulant resistance alleles is critical for maintaining the effectiveness of these rodenticides.

1:50 **Mitigating the risk of rodenticide exposure of aquatic wildlife – a success story?**

Julia Regnery¹, Anton Friesen²,

¹Federal Institute of Hydrology, Department Biochemistry, Ecotoxicology, Koblenz, Germany

²German Environment Agency, Section IV 1.2 Biocides, Dessau-Rosslau, Germany

Exposure of wildlife to anticoagulant rodenticides has been extensively monitored worldwide for a variety of terrestrial species directly or indirectly linked to rodents via the terrestrial food web. Recently, our research demonstrated the relevance of aquatic exposure pathways due to rodenticide emissions to the aquatic environment in conjunction with urban rat management practices such as routine sewer baiting campaigns and bait application in close proximity of surface water bodies. Residues of second-generation anticoagulant rodenticides have been frequently detected in fish and fish-eating predators from urban and peri-urban areas in Germany, revealing a contamination of the aquatic food web comparable to the ubiquitous findings of anticoagulant rodenticides in terrestrial species. New research data confirmed that there will be adverse effects of chronic second-generation anticoagulant rodenticide exposure on fish health at concentrations relevant for surface water bodies, stressing the ecotoxicological impact of unintentional rodenticide emissions. In this context, the role of invertebrates as contamination vectors in urban habitats was also explored. In Germany, strict regulations regarding the sale, supply, and use of rodenticides are in place to mitigate risks. Despite an apparent decrease in amounts of baits and active ingredients used over the past decade, monitoring data from Eurasian otters (*Lutra lutra*) indicate that these measures were not effective yet in reducing the rodenticide burden of aquatic wildlife. Given the increasing number of technical solutions available on the market that comply with regulatory demands to prevent rodenticide emissions to the aquatic environment, there is an urgent need to rethink (former) rat management practices in urban and peri-urban settings in the future.

2:15 **Exposure and potential risk of domestic cats (*Felis catus*) to rodenticidal compounds**

Vesna Cerkvencik-Flajs¹, Detlef Schenke², Simona Korenjakerne³, Anton Perpar⁴, Jens Jacob, Susanne Schwonbeck, Sven Kleine Bardenhorst, Torsten Hahn, Marko Cvetko, Mitja Gomba

¹Veterinary Faculty, University of Ljubljana, Slovenia

²Julius Kühn Institute (JKI), Königin-Luise Str. 19, D-14195 Berlin, Germany

³School of Economics and Business, University of Ljubljana,

⁴Institute of Mathematics, Physics and Biotechnical Faculty, University of Ljubljana, Slovenia

Anticoagulant rodenticides (ARs) are highly effective, but can be of environmental concern due to primary and secondary non-target exposure, and the latter may be relevant for domestic cats (*Felis catus*). Therefore, liver residues of ARs and an alternative rodenticide, γ -chloralose, were systematically monitored in domestic cats for the first time in the current study. In 2021 and 2022, the carcasses of 99 cats were collected in Slovenia and liver residues were measured by solid supported liquid-liquid extraction and LC-MS/MS. The results showed that 65% of cats carried at least one rodenticide. The second generation ARs brodifacoum and bromadiolone were most prevalent, and found in 53.5 and 25.3% of the samples, respectively. Of the first generation ARs, coumatetralyl was the most prevalent (21.2%

of cats). More compounds were detected at high human population density, low farm density and in rural versus intermediate landscapes, but no effect was found for livestock density. Similar trends were found for the presence of brodifacoum, bromadiolone and all rodenticides combined. Farm density was negatively correlated with brodifacoum liver concentration. Individual factors (cat age, sex, outdoor activity) did not matter. The results indicate that a reasonably populated rural landscape, and not the rural or intermediate environment as such, is a main driver of cat exposure to ARs. The risk quotient (RQ) of worst case acute brodifacoum poisoning was 1,506. In summary, a potential environmental problem is globally highlighted for cats that is probably related to secondary exposure to ARs, with a pattern different to that seen in wild predators. Cats are an appropriate sentinel species for assessing rodenticide exposure and endangerment in the environment.

2:40 **Genetic resistance to anticoagulant rodenticides in commensal rodents from Ontario, Canada**

Luigi F. Richardson¹, Catherine Cullingham, PhD.², Albrecht Schulte-Hostedde, PhD.¹,

¹Laurentian University, Vaughan, ON, Canada

²Carleton University

Genetic resistance to anticoagulant rodenticides is a world-wide phenomenon, never investigated in Canada's commensal rodents. Understanding where resistance is prevalent as a function of landscape type can assist industry professionals in their chemical control choices, reduce secondary poisoning risk and help to understand resistance on an ecological and evolutionary level. We sequenced exon 3 of the vitamin K epoxide reductase (rodenticide resistance gene, VKORC1) of house mouse (*Mus musculus*) and Norway rat (*Rattus norvegicus*) samples obtained from pest management professionals in Southwestern and Central Ontario, and Gatineau, Quebec. We detected high prevalence (98%) of 2 non-synonymous single nucleotide polymorphisms in house mice, L128S and Y139C, previously found in Europe, Asia, the Middle East and the USA, known to cause extreme resistance to first and some second-generation anticoagulants. No mutations were found in rats. Homozygous resistant mice, which can even be resistant to bromadiolone by a factor of 17-20, were more common in urban, low-income, high population density areas with lower post-secondary education rates. We conclude that uncoordinated rodenticide usage has selected for extreme resistance throughout Ontario, but genotypes and frequencies vary geographically. Therefore, chemical control of the house mouse with domestic first-generation anticoagulants is unlikely to be successful in Ontario. This knowledge will assist professional pest management operators in understanding what chemicals will be successful for their control efforts in different urban environments for commensal rodents.

3:20 **Efficacy of anticoagulant rodenticides applied to Norway rats (*Rattus norvegicus*) in the sewer system of Berlin, Germany**

Annika Schlötelburg¹, Dorina Meneghini², Jörns Fickel², Anke Geduhn¹

¹German Environment Agency, Department of Health Pests and their Control, Berlin, Deutschland

²Leibniz Institute for Zoo and Wildlife Research, Department of Evolutionary Genetics, Berlin

Second-generation anticoagulant rodenticides (SGARs), commonly used to control rats in urban sewer systems, can enter aquatic environments and bioaccumulate along the food chain. The rodenticide treatment in the sewer system also appears to be replaceable: Cities like Zurich (Switzerland) and Erfurt (Germany) have demonstrated alternative approaches without sewer-based rodenticide use and have no increased rat population. Against this background, we evaluated the efficacy of rodenticide application in the sewer system in Berlin. Rat populations were monitored before rodenticide treatment in the sewers, immediately after, and six months post-treatment. For monitoring population size changes, in the sewers, non-toxic bait consumption and wildlife camera photos were analysed. On the surface, rats were counted using a thermal imaging camera, and a feeding census was conducted. Additionally, 261 rats were captured of which 258 were subjected to for population analyses. Using 86 single nucleotide polymorphisms (SNPs), changes in local gene pools were evaluated over time. This enabled the investigation of the genetic connectivity between above-ground and sewer rats. Preliminary results indicate that rodenticide treatment led to a short-term decline in sewer rat populations. Surface-dwelling rats remained largely unaffected. Moreover, population genetic analyses indicate that the rats caught above and below ground belong to two subpopulations. There is gene flow in both directions, although it appears to be slightly stronger from below to above. This result highlights the need to control connected subpopulations simultaneously and not to limit control measures to rats living underground. These results and the insights into the ecology of urban rats will help to develop a new urban rat management plan in order

to use rodenticides only where necessary and effective. This project is funded by the German Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety (grant number: 3721674020; project duration: 10/2021 – 09/2025).

3:45 **Bromethalin and anticoagulant rodenticide exposure in non-target wildlife in California**

Ryan Bourbour¹, Jaime Rudd², Molly Jarrells¹, Jane Riner¹, Robert Poppenga³, Deana Clifford¹

¹California Department of Fish and Wildlife, Wildlife Health Laboratory, Rancho Cordova, CA, USA

²CDFW WHL; Center for Natural Lands Management - Species Research and Recovery Program

³California Animal Health and Food Safety Laboratory Sys

Rodenticides are widely used to suppress commensal rodent pests that are responsible for significant economic loss and threaten human health worldwide. However, anticoagulant rodenticide (AR) use has resulted in unintended harm to non-target wildlife from well-documented lethal and sublethal impacts caused by acute and repeated exposures. In response to non-target AR exposures in wildlife, California legislation has recently limited AR use. This has resulted in reduced AR use but a greater reliance on other rodenticides, such as the neurotoxic rodenticide bromethalin. Currently, concurrent bromethalin and AR exposure remains poorly understood for wildlife. We assessed rodenticide exposure in four mesocarnivore species (coyote, gray fox, raccoon, striped skunk) examined during mortality investigations led by the California Department of Fish and Wildlife and California Animal Health and Food Safety Laboratory between 2021 and 2025. Of carcasses screened for both bromethalin and ARs (n=122), bromethalin exposure was documented in 52 cases, AR exposure in 99 cases, and concurrent bromethalin + AR exposure in 41 cases. Among bromethalin-positive individuals, 63.5% (33/52) were also exposed to both first- and second-generation ARs. These findings indicate that statewide use of AR alternatives and continued limited use of ARs is resulting in complex co-exposures in non-target wildlife across California. Understanding co-exposure to rodenticides with differing modes of action will be important following changes in rodenticide use in California.

4:10 **From lab to landscape: tracing isotopically labelled anticoagulant rodenticides (ilars) through urban food webs**

Niamh Quinn¹, Chris Morales², Roger Baldwin³, Carolyn Day⁴, Paul Stapp⁵, Steve Volker⁴, Julie Young⁶, Catherine Swift, L

¹University of California Agriculture and Natural Resources, Irvine, CA, USA

²Liphatech Inc.

³UC Davis

⁴USDA

⁵CSU Fullerton

⁶Utah State University

Anticoagulant rodenticides (ARs) are a cornerstone of vertebrate pest control, yet their persistence in wildlife remains a conservation and management concern. Despite decades of research, most monitoring still depends on carcass collection, providing only static, post-mortem snapshots of exposure. To overcome these limitations, we developed and tested an isotopically labelled anticoagulant rodenticide (iLAR). This is an innovative approach for tracing AR movement through urban food webs from the laboratory to the field. In the laboratory, a carbon-13-labelled difethialone compound (C¹³DFN) was synthesized, validated to ensure detectability using mass spectrometry, and formulated into a 25 ppm bait similar to a commercial product. Lab rats were fed the iLAR and then these rats were fed to captive coyotes to ensure that C¹³DFN could be detected in hair, feces, and liver at extremely low expected ecological concentrations (ppb). Field application of the same iLAR bait in a pilot test provided the first direct evidence of how rodenticides move through free-ranging rodent and predator populations in a real-world urban system. Detection of the labelled compound in rodent and coyote samples revealed exposure dynamics, persistence, and trophic transfer under operational conditions. By integrating laboratory precision with field realism, the iLAR framework represents a breakthrough in environmental toxicology and vertebrate pest management. This method provides a clear, traceable signature of compound movement, enabling longitudinal assessment of exposure in living individuals within wildlife populations, and is therefore a powerful platform for evaluating mitigation measures. Together, these advances mark a pivotal step toward more transparent, science-driven rodenticide stewardship.

4:35 **Non-invasive surveillance of rodenticide exposure in an urban carnivore using scats**

Paul Stapp¹, Carolyn Day¹, Niamh Quinn²

¹CSU Fullerton, Fullerton, CA, USA

²UC ANR

Secondary exposure to anticoagulant rodenticides (ARs) remains a significant environmental concern for predatory and scavenging wildlife at the urban-wildland interface. To date, however, rodenticide testing has relied largely upon destructive, one-time sampling. As part of an effort to investigate AR exposure of coyotes in southern California, we tested scats collected in the field over a 20-month period for residues of 8 ARs. By radiotracking a subset of coyotes and genotyping scats from radio-collared and uncollared individuals, we were able to examine repeated exposure to ARs for individual coyotes. Of 922 scats collected, 620 (67%) were from coyotes, from which 160 unique individuals were identified. The number of scats per coyote ranged from 1-30 and the period over which scats were collected from an individual ranged from 1-61 weeks, with scats collected during 1-17 weeks. Among scats, 43.6% had detectable AR residues: 36.3% contained residues of first-generation AR compounds (1-3 types), 20.8% had second-generation compounds (1-3 types), and 14.0% had both kinds. Among coyotes, 59% had residues at least 1 AR; of 60 well-sampled coyotes (>3 scats, from >3 different weeks), 85% were exposed to ARs. Detections and residue concentrations varied among scats, including between scats from the same individual on the same day, and positive exposures were often followed weeks later by scats with no detected ARs. Scats with no ARs were collected in locations with more natural open space, whereas AR-positive scats were in areas with variable levels of development. Among collared coyotes, AR-positive scats tended to be left by coyotes that had recently traveled in less intensively developed suburban areas. Detection patterns over time suggest that scat AR residues depict recent prey exposures rather than internal AR levels of coyotes, indicating that scats could be used help identify areas and times when ARs are applied on the landscape.

Tuesday, March 3 (PM)

**SYMPOSIUM: ADVANCING FERTILITY CONTROL FOR VERTEBRATE PESTS:
RESEARCH, INNOVATION, AND IMPLEMENTATION**

1:25 **Fertility control agents and their mechanisms of action**

Doug Eckery, USDA APHIS WS National Wildlife Research Center, Fort Collins, CO, USA

The management of wildlife and pest species is becoming increasingly necessary throughout the world. At present, some of the most effective methods of wildlife population control are achieved through the use of lethal methods, including poisons, which are becoming more highly regulated. The use of fertility control as a tool to aid in wildlife management strategies is considered to have numerous benefits and has attracted substantial attention. The greatest benefits from the use of wildlife fertility control will be realized when used in conjunction with other tools as part of integrated management programs. The challenges associated with the use of fertility control in wildlife are not only technical in nature, but also involve regulatory, social, political and cultural aspects. The development of an effective fertility control tool is in large part a two-part process. The first is to identify a means to reduce fertility in a target species. This requires knowledge of reproductive biology, physiology, immunology, etc. Once the mechanism of action for the reproductive function is known, it then requires the identification of a method to modify or inhibit that mechanism of action. This could be through the use of the immune system (i.e., vaccine) or using an agent that can directly inhibit the identified mechanism of action. The second part is the development of a means to effectively deliver the agent to the target animals. This could be using a non-transmissible or transmissible method. The focus of this presentation will be primarily on some of the technical aspects of identifying effective agents and their respective mechanisms of action. While effective fertility control tools have been developed, registered and used successfully, there remains the need for additional fertility control tools that offer longer term duration of effect and improved methods of delivery.

1:50 **Immunocontraceptive vaccine for vertebrate pest management: a new approach for population control in rodents and wild pigs**

Mohammed Selman¹, Nikolas Duenas¹, Adam Tarshis¹

¹The Amber and Adam Tarshis Foundation, Los Angeles, CA, USA

Overabundant vertebrate pest populations, such as wild pigs and rodents, cause extensive agricultural damage, threaten native ecosystems, and contribute to the spread of zoonotic diseases. Conventional control methods, including poisoning, trapping, and shooting, are often labor-intensive, costly, and raise welfare and environmental concerns. Immunocontraception offers a humane and sustainable alternative for long-term population management. We have developed live-attenuated poxvirus based vaccine vectors that are specifically targeted to either porcine or rodent species. This platform leverages the natural host specificity of poxviruses while providing a flexible system adaptable for various antigens and routes of administration, including intramuscular and oral delivery. Using this approach, we have engineered vectors expressing gonadotropin-releasing hormone (GnRH) as a target antigen to induce immune-mediated suppression of fertility. The pox vector-GnRH vaccine was constructed and characterized in vitro, confirming stable GnRH antigen expression and replication kinetics. Preliminary in vivo studies in pigs demonstrated safety and immunogenicity. Current research is focused on optimizing the GnRH antigen, extending evaluation to rodent models, exploring oral bait-based delivery systems for field use, and adapting additional poxvirus backbones to expand the platform's applicability across vertebrate pest species.

2:15 **Fertility control as an alternative to lethal methods for reducing livestock predation by large carnivores**

Cheryl Asa, AZA Reproductive Management Center, Saint Louis Zoo, Norwich, Vermont, USA

Decreasing acceptance of lethal methods for controlling predators has encouraged development of alternative approaches focusing on aversive conditioning and deterrence. Success of those methods has been mixed, depending on target species and local conditions. Meanwhile, evidence is accumulating that lethal methods are often not as effective as previously believed. Reductions in predation rates on domestic livestock following lethal removal of large predators, such as cougars and wolves, are not likely to be sustained and may even result in increased livestock predation. Failures can be attributed to several factors. Social disruption following culling can increase predation rates, and population numbers can be restored by immigration from nearby source populations and compensatory reproduction, where reproductive success increases in individuals facing less competition for prey until the population again reaches carrying capacity. Fertility control has been implemented to manage some ungulate populations but has not been fully explored for large predators. In choosing a method for wild canids and felids, features of their social systems and reproductive physiology must be considered to ensure efficacy and safety. Canid predators, such as wolves, coyotes and red foxes, are socially monogamous and have a restricted breeding season during which females ovulate only once. Permanent sterilization of males via vasectomy or epididymectomy preserves this social system. Female-directed methods that allow estrous behavior, needed for pair-bonding to avoid social disruption, require more invasive, potentially risky surgery. Wild felids such as cougars are not monogamous and females not monestrous, so blocking sperm passage in males, preventing pregnancy, could result in multiple estrous periods. The resulting social changes could affect predation rates. Instead, an anti-GnRH vaccine that blocks estrous cycles might be preferable, although repeated treatments would be needed. Despite these limitations, fertility control, alone or combined with other non-lethal approaches, could be more effective than lethal methods.

2:40 **Invasive species management strategies in a One Health system**

Katherine August¹, Steve Belmain¹, Holly Broadhurst², Giovanna Massei³, Samantha Beaudoin, Daniel Bray, Greg Counsell, Simon Croft, Harry Marshall, Helen Whitehead

¹Natural Resources Institute University of Greenwich, Medway, United Kingdom

²University of Salford

³Bostiber Institute for Wildlife Fertility Control

In the UK the Eastern grey squirrel *Sciurus carolinensis* is an invasive species which threatens trees through bark stripping and native wildlife through disease transmission and competition. Grey squirrels are increasingly relevant to human health as reservoir hosts of *Borrelia burgdorferi*, the agent of Lyme disease transmitted by *Ixodes ricinus*, the

tick vector which feeds on several animal species and people, including grey squirrel. Current strategies to manage grey squirrel populations rely on culling via trapping and shooting that are effective to reduce the species' impact on trees and on native species. However, the contribution of grey squirrels to the spread of Lyme disease is poorly understood. As the removal of one host may alter the abundance and behaviour of other potential host species, squirrel control may not have the desired impact of reducing the spread of ticks and disease. This project was aimed to quantify the contribution of grey squirrels to tick and Lyme disease spread and to assess the impact of grey squirrel removal on infection prevalence, vector abundance and on the abundance and behaviour of other potential hosts. Using camera trap surveys and blanket dragging in isolated woodlands in Cumbria, UK, we estimated grey squirrel and tick densities before and after three culling treatments: no cull, full traditional cull, and a partial cull with reduced trap effort. Camera traps and autonomous recording units were used to assess the encounter rates and activity patterns of other vertebrate host species before and after the culling treatments. We used retrotransposon bloodmeal analysis to assess ticks' choice of hosts and tested *Borrelia* prevalence and genospecies in sampled ticks. Based on the results, we will model the effectiveness of culling grey squirrels in reducing the risk of Lyme disease.

3:20 From the bedroom to the bait station: barriers to rat contraception

Niamh Quinn, University of California Agriculture and Natural Resources, Irvine, CA, USA

Interest in fertility control as a nonlethal approach to managing commensal rodents has grown rapidly, fueled by public demand for alternatives to toxicants and regulatory pressure to reduce rodenticide use. However, while the science behind fertility control is advancing, the practical barriers to implementation in urban environments remain largely unresolved. This presentation will explore the operational realities of deploying fertility products for roof rats (*Rattus rattus*) and Norway rats (*Rattus norvegicus*) in complex urban settings. Field observations from Southern California suggest that product success is determined less by chemistry and more by access and whether rats actually encounter, enter, and consume what's offered. Bait station design, placement, and maintenance continue to serve as the weakest link in many management programs. Common issues such as vandalism, blocked access, low visitation rates, and inconsistent servicing frequently limit uptake, regardless of product type. These practical failures highlight a simple truth: fertility control cannot work without reliable delivery systems and behavioral insight. Even the most effective contraceptive agent is meaningless if it never reaches its target population. For fertility control to play a meaningful role in integrated pest management, programs must first master the basics of bait station management (placement, monitoring, and maintenance) and ensure consistent access across rodent populations. In short, successful fertility management for rodents won't begin in the lab-it will begin at the bait station

3:45 The role of fertility control in managing federally protected wild horses and burros in the U.S.

Stephanie Boyles Griffin, Humane World for Animals/Botstiber Institute for Wildlife Fertility Control, Washington, District of Columbia, USA

More than 50 years ago, Congress unanimously passed the "Wild Free-Roaming Horses and Burros Act of 1971" (Public Law 92-195) following a decade-long campaign to end the cruel treatment and exploitation of these "living symbols of the historic and pioneer spirit of the West." Over the decades, stakeholder disputes over the management of America's wild equids have evolved into a fiscal and political quagmire that is now one of the most critical and complex wildlife management issues in the U.S. today. Wild equid management is a highly controversial and contentious – a wide range of disparate stakeholder groups have conflicting opinions about how best to manage populations. But one management approach that is widely accepted by stakeholders is fertility control. Since the 1970s, the Bureau of Land Management (BLM) has supported research to develop safe, practical, effective, and long-lasting fertility control methods for wild horses and burros, and in October 2021, the agency announced that the development of long-lasting fertility control methods for mares remains its highest research priority. Decreasing population growth rates is key to BLM's wild horse and burro management strategy as it has the potential to reduce the need and frequency of wild equid removals which would result in long-term reductions in the program's overall operating costs. This presentation will describe the use of federally registered immunocontraceptive vaccines, such as GonaCon and ZonaStat-H, and demonstrate how, when coupled with strategic gather and removal scenarios, these vaccines can reduce and maintain populations at Appropriate Management Levels (AML). This presentation will also discuss the development of promising new methods, such as longer-acting vaccines, and remaining challenges that must be addressed for BLM to

expand the use of effective, humane, and sustainable fertility control methods to all 177 Herd Management Areas in 10 western states.

4:10 **Advances in effective fertility-based management of free-roaming cats**

John D. Boone, Great Basin Bird Observatory, Reno, NV, USA

Free-roaming cats (FRCs) are a ubiquitous presence in and around the human landscape, but they remain controversial. For decades, the ongoing “cat wars” have pitted conservationists and public health officials against animal welfare organizations and cat advocates in matters of both public policy and alternative management approaches. An especially strident point of debate concerns the current effectiveness and future potential of non-lethal approaches like Trap-Neuter-Return (TNR) for viable FRC population management. In an effort to bridge this divide, multiple initiatives have sought to better integrate established principles and techniques of wildlife management into the framework TNR. For many years, progress along these lines has been slow, but more recently it appears to be accelerating. Major case studies from Israel and Spain have illustrated that well-designed, sustained, and intensive TNR can reduce FRC numbers substantially at intermediate scales. A large body of guidance has also emerged to support better management design, monitoring, and outcome assessment. Most recently, new guidance for funders has been developed to encourage prioritization of and adequate support for well-designed, larger-scale TNR projects that layer multiple, synergistic management elements. Finally, new nonsurgical tools for contraception and sterilization are becoming widely available, with many more anticipated to enter into use in coming years. Collectively these efforts appear poised to make fertility-based reduction in FRC numbers at meaningful geographical scales an increasingly realistic and achievable prospect. Many of these new developments will also be relevant to better management of wildlife species by means of fertility control. In this talk, Dr. Boone will review advances in the fertility-control management model for cats, present new initiatives and likely future trajectories, and consider their application beyond cats to include other vertebrate species of interest.

Wednesday, March 4 (AM)

SYMPOSIUM: COMMENSAL RODENTS AT THE GLOBAL CROSSROADS

8:15 **Population genetics of the Brown Rat (*Rattus norvegicus*) in a heterogeneous urban landscape**

Martin Scaltritti¹, Emiliano Muschetto¹, Ignacio M. Videla¹, Mariel A. Tripodi¹, Diego Hancke¹, Esteban Hasson¹, Viviana A. Confalonieri¹, Olga V. Suárez¹

¹IEGEB (UBA-CONICET), Ciudad Autónoma de Buenos Aires, Argentina

Rattus norvegicus, a globally distributed invasive species, has successfully established urban populations in close association with humans posing significant economic and public health challenges worldwide. Understanding the relationship between landscape features and genetic differentiation among *R. norvegicus* populations is crucial for developing effective control and management strategies. The aim of this study was to analyze the genetic connectivity among *R. norvegicus* populations in different urban environments of the Metropolitan Area of Buenos Aires including parks, urban reserves, port areas, informal settlements, and residential neighborhoods. A total of 69 individuals were captured and analyzed from 15 sites representing diverse urban settings. Genomic DNA was extracted using the salting-out protocol, and Restriction-site Associated DNA sequencing (RADseq) was employed to analyze 863 SNPs distributed across the genome. Nei's genetic distances and principal component analysis revealed clustering among populations from proximate sites, while F_{ST} fixation indices indicated that most populations from different sites are genetically distinct. Furthermore, analysis with STRUCTURE v2.3.4 identified four genetic populations that largely correspond to the previously identified clusters. The high genetic similarity among populations from nearby sites, along with the observed population structuring, can be attributed to limited dispersal of *R. norvegicus*, the inherent environmental heterogeneity of the urban matrix, habitat fragmentation, and the presence of landscape features acting as barriers or corridors to gene flow. These findings provide valuable insights for the development of more effective, ecology-based management plans in the Metropolitan Area of Buenos Aires and its surrounding regions.

8:40 **Smoke testing sewer lines helps determine rodent control strategies**

Michael Walls¹, Miles Bosarge¹

¹*Alameda County Vector Control, Alameda, CA, USA*

In Alameda County, two rat species that commonly invade residential structures and surrounding neighborhoods are the Norway rat, *Rattus norvegicus*, and the roof rat, *Rattus rattus*. Norway rats are common in jurisdictions with older sanitary systems. These rats can find openings as small as a diameter of a dime to enter and inhabit spaces with humans. In some cases, after a thorough inspection, no exterior openings are found that allow rats access to the interior. Smoke testing the sewer system can reveal potential gaps in sewer lines from which Norway rats exit. Deciding which type of test to use and proper administration of these tests are important aspects of completing our inspections and finding all potential entry points for Norway rats.

9:05 **The Spread of Norway rats from urbanized to suburbanized portions of Alameda County**

James Bohn¹, Kimberly Daum¹, David Popko¹

¹*Alameda County Vector Control, Alameda, CA, USA*

In Alameda County, populations of the Norway rat, *Rattus norvegicus*, have historically been associated with heavily urbanized environments, and are especially common in the city of Oakland. Prior to the summer of 2023, the Alameda County Vector Control Services District (ACVCSD) had no documented reports of Norway rats appearing in cities in the southern suburbanized portion of County. The first confirmed sighting of a Norway rat in a city in the southern part of the County was in July of 2023. The rats were confirmed to be Norway rats upon a routine inspection of a residential property in the city of Fremont. Upon further investigation, two additional neighboring properties also had Norway rat infestations. To determine the extent of the Norway rat population around the area of the original infestation, ACVCSD conducted surveillance of the impacted areas. After five weeks of surveillance, we determined there to be substantial above-ground Norway rat populations within the neighborhoods, and that they that did not originate from the sewers. This presentation details the procedures and techniques used in our surveillance program. Our findings raised the following questions: How long have Norway rats been in the suburbs of Alameda County? How did they get there? What is sustaining and growing their population? How does this change our understanding of Norway rats?

9:30 **Assessing the abundance and impact of brown rats in Chicago's community gardens**

Andrea Flores¹, Kaylee Byers², Danielle German³, Mason Fidino¹, Seth Magle¹, Maureen H Murray¹

¹*Lincoln Park Zoo, Chicago, IL, USA*

²*Simon Fraser University*

³*Johns Hopkins University*

Brown rats (*Rattus norvegicus*) are a commensal rodent that contribute to disease transmission and are reported in community gardens, potentially creating public health risks. To understand the impacts of rats on gardener well-being and identify garden features associated with rat activity, we modified the AHDriFT camera trap method and collected videos of rats in 25 Chicago community gardens in Summer 2024 and 2025. This passive monitoring method was previously used to successfully estimate rat activity in alleys. Visual surveys of gardens were conducted to quantify available rat resources during the growing season, while the camera was active. Simultaneously, we distributed a survey to community gardeners across Chicago to assess the impact of rats on gardener well-being. We received 352 survey responses (232 English, 20 Spanish) from gardeners in 83 community gardens. Of gardeners who saw rat signs in the garden, 73% found gardening less enjoyable and 59% lost produce because of rats, undermining the physical and mental health benefits of community gardens. We will discuss the opportunities and challenges associated with rat management in urban gardens from case studies and participatory workshops. Our results will help create recommendations for garden design and gardener behavior to control and prevent rats to enhance the benefits of community gardens for people and biodiversity in cities.

10:15 **Norway rat gut microbiome assessment - evaluating the zoonotic potential and environmental correlates of disease risk in urban rats**

Kalynn Cheeks, Jonathon Richardson, University of Richmond, Richmond, VA, USA

Microbial communities play a crucial role in maintaining the health of organisms, but can also harbor potentially zoonotic species relevant for public health. Urban ecosystems have had a substantial impact on wild rat populations, which exhibit high variability in their microbiomes and disease burden risk. In this study, we characterize the gut microbiome of wild rats in Richmond, Virginia (metro population of 1.2 million people) to determine whether microbial composition and the presence of zoonotic pathogens vary based on factors like the location of capture, season, rat population demographics, urbanization, and socioeconomics. We sampled rats across Richmond between 2020 and 2024. A metagenomics workflow was applied to fecal samples from 160 necropsied rats, targeting the bacterial 16S gene using nanopore sequencing. These rats carried at least 16 known zoonotic bacteria, yet there were minimal differences in microbial and zoonotic pathogen compositions between locations, time of year, or rat demographics. We did identify several novel zoonotic pathogens previously unreported in Virginia. Our findings have important public health implications, as it is important to determine the type of zoonotic pathogens and their distribution across a city, in order to identify vulnerable communities and create initiatives to protect resident health at a local scale.

10:40 **Re-evaluating the health risks of urban rodent infestations**

Changlu Wang¹, Xiaodan Pan¹, Jin-Jia Yu¹, Babatunji Daramola¹

¹Rutgers University, New Brunswick, NJ, USA

Mice and rats are among the most common and significant urban pests found inside and outside buildings. It is well known that they carry many disease pathogens. However, less well-known are the ectoparasites, allergens, and psychological effects associated with rodent infestations. Understanding their impact on human health is critical in formulating future public health strategies. Here, we review recent studies on rodent ectoparasites, mouse allergens, and the mental health impacts of rodent infestations. A high abundance of biting arthropods was found on urban rodents. Most of the mouse-infested homes had levels of mouse allergen above the asthma risk level. Rodent infestations are associated with increased depressive symptoms. Effective rodent control has been shown to significantly reduce these health risks. Therefore, strengthening the rodent prevention and management policies and practices is needed to reduce rodent infestations and the associated health concerns.

11:05 **Beyond numbers: developing a rat risk index to guide context-specific urban management**

Sarah J. Robinson¹, Chelsea G. Himsworth², Claire M. Jardine³, David L. Pearl⁴, Kaylee A. Byers²

¹Faculty of Health Sciences, Simon Fraser University, Guelph, ON, Canada

²School of Population and Public Health, University of British Columbia

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⁴Department of Population Medicine, Ontario Veterinary College, University of Guelph

Rats present persistent challenges for cities worldwide, with ecological, economic, and public health consequences. The risks they pose are shaped by local environmental and socioeconomic factors, making context essential for effective management strategies. In Canada, recent studies highlight how regional differences influence both the pathogens rats carry and the harms they impose. In our surveillance of urban rats in southern Ontario, we found no evidence of Seoul hantavirus or *Rickettsia* spp., consistent with similar findings from Vancouver, British Columbia, despite both pathogens being endemic in rat populations elsewhere globally. These results highlight how local ecological and socio-environmental factors mediate disease risks and underscore the need for region-specific approaches. However, disease is only one dimension of rat-associated harm. Even in the absence of these pathogens, rats affect food security, infrastructure, ecosystems, and community well-being, with burdens often concentrated in underserved neighbourhoods. Cities invest substantial resources to mitigate these harms, but management programs may fall short because they focus on reducing rat numbers rather than addressing the environmental and social conditions that allow rats to thrive. To support more strategic, context-specific action, our team is developing a locally adaptable Rat Risk Index. This composite metric integrates measures of infestation magnitude with the diversity and severity of rat-associated consequences, drawing on ecological monitoring, socio-spatial risk mapping, municipal key informant interviews, and community-level data. By centering harms rather than abundance alone, the Rat Risk Index

aims to help municipalities prioritize high-risk areas and allocate resources more effectively. This work underscores the importance of regional variation in rat-associated risks and demonstrates a shift toward proactive, evidence-informed urban rat management. By framing risk through consequences rather than just abundance, cities can pursue more targeted, equitable, and forward-looking approaches to rat management.

11:30 Mapping urban rat risk: predictive habitat suitability models to guide municipal pest control

Jonathan Richardson¹, Nicholas Parlavecchio¹

¹University of Richmond, Richmond, VA, USA

Commensal rats are among the most challenging urban pests, thriving in cities where food resources, human activity, and complex infrastructure provide abundant opportunities for shelter and reproduction. Their presence poses significant public-health risks through disease transmission, contributes to structural damage, and can elevate stress and reduce quality of life for residents. Because managing rat infestations is often reactive and resource-intensive, cities increasingly need predictive tools that identify where rats are most likely to occur and which features of the urban environment facilitate their persistence. In this study, we developed habitat suitability models for urban rats across six major cities (NYC, Boston, DC, Chicago, Salvador, Vienna). Although such models are widely applied to natural wildlife species, they are rarely adapted for urban pests. Using GIS-based environmental layers and spatial statistical modeling, we integrated rat sighting records, municipal inspection data, and fine-scale, city-specific variables to generate high-resolution habitat maps. Across cities, consistent patterns emerged: rat occurrences were strongly associated with areas of high human population density, older building stock, and proximity to green spaces, although the relative importance of each predictor varied by city. We will present these results along with our ongoing efforts to synthesize city-level models into a generalized, transferable framework. Such a tool could support municipalities that lack extensive rat surveillance programs, enabling proactive management strategies and more efficient allocation of pest-control resources.

Wednesday, March 4 (AM)

SYMPOSIUM: NEW FRONTIERS IN MANAGING WILD PIGS

8:15 America's best idea, impaired: Wild pig expansion and management across the National Park Service

Anna C. Racey¹, John M. Tomecek¹

¹Texas A&M University College Station, TX, USA

Invasive species directly oppose the mission of the National Park Service (NPS) to conserve nature and history for the enjoyment of future generations. Wild pigs (*Sus scrofa*) stand out among them by significantly impacting ecological, cultural, and historical resources, as well as visitor experience and NPS operations. Their presence is expanding in North America, both in range and abundance, with high densities in the southeastern United States, Texas, California, and Hawai'i. We aimed to understand the distribution of wild pigs across parks, identify areas where future invasions were anticipated, and how parks responded through monitoring and management efforts. We distributed a survey to natural resource park employees through their region leads and received completed responses from 45% of parks. 37 parks had wild pigs present, five uninvaded parks had adjacent populations, and seven parks anticipated invasion within the next five years. Concerningly, 33 parks were unsure about adjacent populations, and 33 were unsure whether to anticipate invasion at all. We used tests of differences to compare nominal variables such as presence, adjacent presence, anticipation of invasion, monitoring, management, and regions, to show the strength of relationships between variables. Descriptive summaries of survey responses and further data analysis using multivariate approaches provided insights into the status of this detrimental invasive species across parks and their responses to invasion. These findings set a precedent of wild pig management in protected areas and identify areas with knowledge gaps regarding adjacent populations, helping resource managers decide whether to monitor for emergent invasions.

8:40 **What are you doing? Towards a discussion on wild pig management objectives**

Michael J. Bodenchuk¹, Aaron Sumrall²

¹*Wildlife Biologist, ²Field Engine Wildlife Research and Management, Hondo, TX, USA*

Wild pigs in the USA are an invasive species capable of damaging agriculture, property, natural resources and human health and safety. Considerable research has been conducted on methods for removal, economic damage and natural history of wild pigs in the country. Where newly established or geographically isolated populations exist, eradication should remain the objective. But for much of their range well established metapopulations mixed with fragmented land ownership, cultural connections to pigs and logistical, financial and political hurdles preclude eradication. In these cases, wild pig management objectives that fall short of eradication will affect how managers approach method selection, timing of control and resource allocation. This presentation will include a decision matrix for managers to consider when initiating a project.

9:05 **Wildlife Services' African Swine fever preparedness & response efforts for feral swine**

James Grinolds for Michael Glow¹, Gregory A. Franckowiak¹, Michael Marlow¹, Dana Cole¹

¹*USDA/APHIS/WS, Fort Collins, CO, USA*

African swine fever (ASF) is a highly contagious foreign animal disease of domestic and wild pigs that results in substantial economic and production losses globally from the morbidity and mortality of affected swine, and trade restrictions imposed on affected countries. In light of the global movement of ASF and its detection in the Caribbean in 2021, there is much concern regarding the introduction of this highly virulent disease to the United States. Given the tremendous impact an ASF introduction would have on the U.S. pork economy, the need for USDA preparedness and response planning is necessary. To fulfill these needs, the Animal and Plant Health Inspection Service's (APHIS) Wildlife Services (WS) program continuously surveils feral swine for foreign animal diseases during removal operations, began securing resources needed to capture feral swine during an outbreak, and has developed outreach tools for reporting feral swine during morbidity and mortality events. In the event of an ASF outbreak in feral swine, Wildlife Services will work collaboratively with APHIS Veterinary Services and state partners to minimize disease spread and to eliminate the virus. This presentation will highlight the most recent Wildlife Services' ASF monitoring and preparedness methods and accomplishments. With increasing global spread of ASF, and its most recent detection in the northwestern hemisphere, WS is proactively working to minimize the risk of ASF virus introduction into the United States.

10:15 **ASF surveillance in the United States by USDA Wildlife Services**

James Grinolds, USDA/APHIS/WS, Fort Collins, CO, USA

African swine fever (ASF), a highly contagious viral disease with a devastating impact on both domestic and feral swine (*Sus scrofa*) as the mortality rate is 95-100% with some viral strains. While not zoonotic, it can be transmitted to pigs by either direct or indirect contact of bodily fluids from infected pigs. There are currently no approved vaccines available in the United States, which highlights the importance of ASF surveillance in both domestic and feral swine to ensure rapid detection if the virus was introduced. While the United States has to date remained ASF-free, ASF was been detected on the island of Hispaniola in July 2021 and is now considered endemic to the island. With the proximity of Hispaniola to Puerto Rico (PR) and U.S. Virgin Islands (USVI), there was a high risk of disease transmission by means of mail, food products, and illegal boat landings. Wildlife Services has integrated surveillance strategies to remove feral swine from both PR and USVI and collect whole blood and blood swab samples for feral swine on both territories. These samples were tested using both antigen-based (PCR) and antibody-based (ELISA) diagnostics. With the threat of ASF transmission from the Caribbean, Wildlife Services also started surveillance in very-high risk counties in Florida, Georgia, Louisiana, and Texas in May 2022. This surveillance was then expanded to very-high risk counties from a total of twelve states to include the potential ASF introductions from global and border pathways. As of September 30, 2025, Wildlife Services have sampled 3,918 feral swine from PR, 15 from USVI, and 23,834 from the continental U.S. All samples tested using PCR and ELISA diagnostics have come back negative. This talk will highlight the accomplishments Wildlife Services has had in ASF surveillance efforts.

10:40 **Evaluating ecological effects on swine carcass decomposition: a meta-analysis with implications for disease management**

Mary J. Woodruff¹, Huda Tawir¹, John R. Foster¹, Ryan S. Miller¹

¹USDA-APHIS Center for Epidemiology and Animal Health, Chicago, IL, USA

Controlling the spread of African swine fever virus (ASFv) is crucial for economic stability and food security. A key component of ASFv spread is transmission among wild pigs, which can occur through interactions with infected swine carcasses. Duration of carcass presence positively correlates with ASFv spread, making it a potential tool for identifying high-risk areas. While swine carcass decomposition has long been studied in forensic science, there are limited empirically informed estimates of decomposition rates across different ecological conditions. Such decomposition rate estimates could be used to approximate the timing of ASFv introduction via estimating the days postmortem of an ASFv positive carcass. We address this gap with an analytical meta-analysis of swine carcass decomposition data from 60 studies across three decades of peer-reviewed literature (n = 176 treatment groups). We extracted data on swine carcass decomposition (total body score, decomposition stage, and percent mass remaining) across time (days postmortem and accumulative degree days (ADD)) and tested for the effect of carcass characteristics (age group, starting weight, domestic vs. wild), study design (scavenging type allowed and location), and environmental conditions (climate zone and mean and variation of: temperature, precipitation, soil moisture, shortwave radiation, potential evaporation rate, and relative humidity). We collected NOAA NCEP-NCAR Reanalysis 1 environmental data using study locations and dates. We used a model comparison framework to determine which variables best predicted decomposition (lowest Δ AICc) while controlling for the random effect of study ID. Initial results suggest that not only does decomposition increase with increases in days postmortem and ADD, but that scavenging type, location, and variation in shortwave radiation positively affect decomposition while starting weight negatively affects decomposition. Our results will inform predictions of decomposition rates across ecological conditions and provide a guide for estimating carcass days postmortem. These data are critical for improving outbreak response decision-making.

11:05 **Multiple threats at the border facilitated by an invasive species**

David L. Bergman¹, Maria Isabel Hernandez Angel², Michael Bodenchuk³

¹Independent Researcher, Phoenix, Arizona, USA

²Fed MVZ

³Independent Researcher, Hondo, TX, USA

Feral swine (*Sus scrofa*) are well established along the border with Mexico especially within Texas. They have the potential of being a prey species for the common vampire bat (*Desmodus rotundus*). Vampire bats are expanding their range northwards along both the east and west coasts of Mexico with the potential to become part of the fauna of the United States of America. Suitable habitat in the southern US has been identified as capable of hosting vampire bats. While range expansion isn't unexpected, vampire bats host a multitude of diseases with vampire bat variant rabies having an economic and health impact to wildlife, livestock, and humans. Beginning in Fiscal Year 2016, Wildlife Services programs in Arizona, New Mexico, and Texas began monitoring livestock as sentinels for vampire bats. Surveillance of livestock is conducted at sale barns, feedlots, dairies, and on ranches to maximize the opportunity to detect bat bites. While no signs of vampire bats or vampire bat vectored diseases have been identified to date, a new concern has arisen that may be tied to feral swine and vampire bats, the New World screwworm (*Cochliomyia hominivorax*).

Wednesday, March 4 (PM)
SYMPOSIUM: COMMENSAL RODENTS AT THE GLOBAL CROSSROADS

1:25 Diets of commensal roof rats (*Rattus rattus*) in southern California

*Gabriela Guzman*¹, Paul Stapp², Niamh Quinn³

¹*Department of Biological Science, CSUF; UCANR, Cooperative Extension, Irvine, CA & UBC, Fullerton, CA, USA*

²*Department of Biological Science, California State University Fullerton*

³*University of California Agriculture and Natural Resources*

Rats (*Rattus* sp.) are a successful invasive species in part because of their ability to exploit their commensal relationship with people. Because rats are opportunistic feeders, understanding their diet can lead to the development of better, targeted pest-management strategies. We collected roof rats (*R. rattus*) across five urban land-use types in Los Angeles and Orange Counties, California, USA, and estimated their diet using stable carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$) stable isotope analysis. Isotope values were analyzed using a Bayesian mixing model (MixSIAR) to estimate dietary contributions of anthropogenic food, invertebrates, and C3 plants. We also determined area and overlap of isotopic niche space using rKIN and examined relationships between consumption of anthropogenic foods and landscape characteristics at collection locations. Roof rats from commercial and institutional areas had the highest $\delta^{13}\text{C}$ values and were estimated to consume mostly anthropogenic foods. Residential rats had the largest isotopic niche area, reflecting greater dietary diversity, and had the highest dietary contributions from invertebrates. Those from open space areas were estimated to eat a mixture of invertebrates and C3 plants, whereas those from urban farms had the smallest isotopic niche area and primarily consumed C3 plants. Norway rats (*R. norvegicus*), another commensal rat sampled from one commercial site, had higher $\delta^{13}\text{C}$ values than any roof rat group and appeared to have mainly fed on anthropogenic foods. Our findings highlight the ability of roof rats to shift diets based on food availability, emphasizing their ecological adaptability and likely making a single management strategy ineffective.

1:50 Global variation in urban rat body size: ecological drivers and implications for pest management

*Jeff (Ping Yeng) Tsai*¹, Jonathan Richardson¹, et al.

¹*University of Richmond, Richmond, VA, USA*

Commensal rats in the genus *Rattus* are among the world's most widespread and impactful urban pest species. Two species (*Rattus norvegicus* and *Rattus rattus*) occupy near-global distributions that span broad environmental gradients. Because many of these environmental variables can shape small mammal physiology and impose strong natural selection pressures, understanding global patterns of rat morphology is essential. In this study, we partnered with researchers across more than 30 cities worldwide to assemble a large comparative dataset of body sizes for both species. We quantified size distributions within cities, compared them across cities, and examined how body size correlates with environmental factors. Rat body size consistently increased in warmer regions and at lower latitudes. We also examined how urbanization and human population density relate to patterns of body-size variation. This work provides one of the first global assessments of body size variation in urban rats and the ecological drivers underlying that variation. These insights have practical implications for pest management, offering predictive guidelines for calibrating rodenticide dosing and trap design to regional differences in rodent body size.

2:15 Caught in the middle: a community development manager's balancing act with rodent control, regulation, environment and community involvement

Andrew Herndon, Irvine Campus Housing Authority, Irvine, CA, USA

Rodent control in high-density residential communities is increasingly being scrutinized, particularly where human safety and non-target wildlife concerns intersect. At the Irvine Campus Housing Authority, a multi-faceted and adaptive rodent management program has been implemented under the direction of Vice President of Community Development Andrew Herndon. Efforts have been shaped by ongoing interest from advocacy groups such as HOOTS (Help Our Owls To Survive), who have called for the complete elimination of poison rodenticide use. In response, a strategy grounded in integrated pest management (IPM) has been developed and refined. Snap trapping has been prioritized and tracked over multiple years, and cholecalciferol has been utilized as a non-anticoagulant alternative to

traditional rodenticides. More recently, the contraceptive bait Evolve has been trialed, and several owl boxes have been installed to encourage natural predation. Operational challenges, shifting community expectations, and persistent pest pressures have all been encountered throughout the implementation of this program. Outcomes from these efforts have been monitored and used to guide ongoing decisions. This presentation will highlight the successes and limitations experienced, offering a real-world example of how rodent control can be managed under regulatory constraints and public scrutiny.

2:40 **From pathogens to property damage: the quantified burden of urban rats**

Carly Hilbert¹, Kaylee Byers¹, Chelsea Himsworth¹

¹University of British Columbia, Vancouver, BC, Canada

Harms attributed to urban rats (*Rattus rattus* and *Rattus norvegicus*) have been documented and quantified across public health, economic, and environmental domains, employing diverse metrics and reporting practices. A structured search strategy was developed using four core concepts—rats, harm, public health, environmental impact, and economic loss—with multiple synonym sets combined through Boolean operators. Comprehensive searches were conducted in Web of Science, PubMed, Google Scholar, and the UBC Library system using broad search strings incorporating terms such as “urban,” “rats,” and “harm”. Peer-reviewed and grey literature published in English within the past 50 years from North America were eligible for inclusion. Studies were included if they examined harms in urban settings, focused on *Rattus rattus* or *Rattus norvegicus*, and provided more than a passing mention of harms; studies were excluded if they did not directly measure harms or relied solely on anecdotal descriptions. For this review, harm was defined as any measurable negative consequence arising from the presence, activity, or byproducts of urban rats, while “quantification” referred to assigning harms to any numeric or comparable metric, most commonly monetary valuation. The search strategy yielded a diverse body of literature encompassing public health outcomes (e.g., pathogen transmission, contamination, sanitation impacts), environmental degradation (e.g., infrastructure damage, biodiversity effects, ecosystem disruption), and economic losses (e.g., property damage, food spoilage, resource claims). This approach provides a systematic foundation for characterising the scope and magnitude of rat-related harms in urban contexts and highlights gaps in measurement methods and reporting standards across disciplines.

3:20 **Foraging behavior of urban rodents inside and outside residential buildings**

Changlu Wang¹, Xiaodan Pan¹

¹Rutgers University, New Brunswick, NJ, USA

Managing rodent pests in and around buildings often relies on rodenticide baits and traps (snap traps or glue traps). Understanding rodent foraging behavior and their interactions with various control devices is important in rodent management. By installing game cameras in areas of rodent activity, we recorded daily and hourly activity patterns of rodents, interactions with baits, traps, and rodent stations, as well as rodent nesting behavior. Results suggest that rodents often ignore traps, bait stations, and other rodent control devices. They follow established trails and feed on familiar food sources. These findings suggest that strategically placing control devices and using more attractive materials are crucial for increasing the acceptance of the rodent control devices and improving the rodent control results.

3:45 **Pellets not poison: Experimentally evaluating contraception to manage rats in an urban neighborhood**

Maureen Murray¹, Andrea Flores¹, Alaina Gonzalez White², Seth Magle¹, Judy Pollock³, Matthew Igleski³, Cheryl A. Dyer², Loretta Mayer²

¹Lincoln Park Zoo, Chicago, Illinois, USA

²Wisdom GoodWorks

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Anticoagulant rodenticides are commonly used to manage rats in cities around the world, but cause illness and death in non-target wildlife. Oral contraception for rats in the form of supplemental feed may offer a more sustainable, humane, and wildlife-friendly tool to reduce rat populations. However, the efficacy of contraception to manage rats in urban neighborhoods has not been demonstrated using a robust experimental design. In this project, we evaluated the

efficacy of GoodBites contraceptive pellets in a high-density urban neighborhood in Chicago, Illinois, USA. We measured relative rat activity in three ways: 1) the mass of pellets consumed weekly, 2) the frequency of rat visits to feeding stations via camera traps, and 3) the number of unique rats detected per night in camera stations independent of feeding stations (RatCams). We deployed RatCams on four city blocks containing feeding stations and on four nearby blocks without feeding stations that served as control areas. We selected the study areas in partnership with community leaders and municipal officials to confirm rat problems and increase buy-in. This experimental trial will run from August 2025 – August 2026 to determine 1) if rat activity is suppressed on contraception blocks relative to control blocks and over what timeframe; 2) if consumption of the contraceptive pellets can be used as a proxy for relative rat activity; and 3) if non-target species are able to access contraceptive pellets in exclusionary feeding stations. We will present preliminary results for the first six months of the project as well as opportunities and challenges when using contraception in high-density urban environments. Our results will guide best practices for reducing the use of anticoagulant rodenticides to manage rats in cities while protecting urban biodiversity.

4:10 **Ecotoxicology as Part of the Pesticide Registration Process**

Alexander S. Kolosovich, California Department of Pesticide Regulation, Sacramento, CA, USA

4:35 **Citizen Science or Industry Science? Using Industry Data to Address the Wicked Problem of Urban Rodents**

Luis Agurto, Jr.¹, Rafal Stryjek² & *Michael H Parsons³

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Urban rodent presence has been identified as a “wicked problem,” shaped by stakeholders with varying definitions of success and conflicting incentives. Social, and economic pressures—including stigma and the risk of fines—often lead property owners to ignore or conceal rodent activity. Although the scientific literature contains remarkably little urban rodent data, collecting this data can expose property owners to liability, place researchers in difficult positions, and threaten business models. We are addressing this problem as a new form of citizen science—one designed specifically for industry. With the latest generation of remote-sensing tools and the large number of PCOs already gathering information through routine operations, we now have mechanisms to obtain essential ecological data without requiring residents to “rat on” neighbors. Our project will develop two data streams: an IoT network of sensors, smart traps, and video that detect and monitor rat presence, movements, and behavior, providing insight into population ecology and treatments; and the effectiveness of interventions such as alternatives to rodenticides, including contraceptives. The second data stream involves a digital application called “rodent log” built on standardized data collection protocols for information already gathered by PCOs. A shared data commons is being developed to make these data accessible to industry partners seeking efficiency and researchers aiming to generate actionable ecological insights. Our goal is to demonstrate how appropriate, standardized rodent data can help pest management professionals and researchers identify the most effective IPM strategies, while enabling policymakers to pursue better source reduction efforts and reduce reliance on rodenticides. In the future, our protocol and digital application will support pathogen monitoring of rat carcasses submitted by PCOs, further protecting neighborhood health.

Wednesday, March 4 (PM)
CONCURRENT SESSION: GENERAL SESSION

1:25 **Rise of the raven: A conservation blind spot**

Pat Jackson¹, Peter S. Coates², Seth Dettenmaier², Cali Roth², Shawn O’Neil², John Boone¹, Tony Wasley³

¹Great Basin Bird Observatory, Reno, NV

²US Geological Survey, Dixon, CA

³Wildlife Management Institute, Reno NV

The common raven (*Corvus corax*) has been identified as the most widespread nest predator of greater sage-grouse (*Centrocercus urophasianus*). Common raven nest predation has also been documented to negatively impact several other sensitive avian species. Although a native species and natural predator, various human subsidies including non-traditional food sources (e.g., roadkill, landfills) and artificial nesting structures (e.g., power and utility lines),

dramatically increased common raven abundance as much as 1600% in some areas. Increased common raven abundance coupled with habitat loss and degradation (e.g., invasive annual grass invasion, tightened wildfire cycles and anthropogenic surface disturbance projects) is continuing to put additional negative pressures on a growing list of species. We intend to present: 1) common raven population growth, 2) potential factors that influence that population growth, 3) a summary of species impacted by this population growth 4) an overview of a Science-based Management of Ravens Tool (SMaRT), 4) a three-tiered management approach, and 5) a call for awareness and unity on a growing conservation blind spot.

1:50 **Effectiveness of starling roost management in Hamamatsu, Shizuoka Prefecture, Japan**

Masaki Shirai¹, Momoyo FUJIOKA², Takahiro IKEDA³, Yoshinori SHIMIZU³,

¹Central Research Institute of Electric Power Industry, Abiko, Chiba, Japan

²Nagaoka University of Technology

³PiPhotonics, inc.

The grey starling (*Spodiopsar cineraceus*) establishes overnight roosts that collectively accommodate up to several thousand individuals in urban areas. Starling roosts are considered a nuisance due to the aggregation of noisy bird calls and pollution associated with droppings, which lead to conflicts with humans. Although several management techniques have been implemented, their effectiveness remains uncertain. Therefore, this field study evaluated the effectiveness of various management approaches aimed at limiting overnight grey starling roosts. The study examined the use of starling roosts in urban trees (Japanese zelkova, *Zelkova serrata*) along Kajimachi Street in Hamamatsu, Shizuoka Prefecture, Japan, during November 7–14, 2021. Management operations were performed on weekdays by three teams of two people, starting after 18:00. Therefore, weekdays and weekend days were designated as experimental and control days, respectively. During management operations, three types of deterrent techniques (light stimulation, loud noises, and impact/vibration) were applied as appropriate. We observed 33 zelkova trees during evening (16:30–17:45) and midnight (22:30–24:00) roosting surveys, to ascertain the presence or absence of starlings on each tree. The effectiveness of countermeasure operations was evaluated by comparing the results of the evening and midnight roosting surveys on experimental and control days. On control days, 12 and 10 zelkova trees, on average, were used as roosts during the evening and midnight surveys, respectively. On experimental days, an average of 16 zelkova trees were used as roosts during the evening survey, whereas only 6 trees were used by starlings during the midnight survey, representing a 60% reduction rate. This reduction rate was significantly higher on days when management operations were implemented, confirming the effectiveness of the management techniques in driving starlings away from roosting sites in Hamamatsu.

2:15 **Infestation of a federal office building by poultry bugs (*Haematosiphon inodorus*) associated with barn owls (*Tyto alba*)**

Maia Walls, Alameda County Vector Control, Alameda, CA, USA

The Poultry Bug is an avian parasite of poultry and raptors with characteristics related to the human bed bug (*Cimex lectularius*). In the early 1900s, Poultry bugs were known as pests of poultry farms from the Southwest U.S. into Mexico and were also found sporadically in raptor nest studies. Since that time there are few records of it being encountered beyond those cases. In September 2024, the Alameda County Vector Control Services District investigated a case involving a federal office building infested with Poultry Bugs. We were initially informed that employees inside the building were experiencing bites from insects that were bedbug-like in appearance. The building is seven stories tall and had reports of the insects being sighted on all floors, but most heavily impacting the fifth floor. Several Barn Owl (*Tyto alba*) nests and Cliff Swallow (*Petrochelidon pyrrhonota*) nests were present on the exterior building, and we started to suspect that a barn owl nest located on a ledge outside the fifth floor was the initial source of the infestation. Specimens were collected from inside the building and their identification was confirmed to be Poultry Bugs. This was immediately interesting and unusual since there are no records of Poultry Bugs in Northern California, nor any previous records of them infesting office buildings. After more than a year, the infestation was finally brought under control.

2:40 **Effectiveness of the AVIX Handheld 500 laser as disruptive stimuli to repel birds from a dairy, feed storage area, and feedlot with opportunistic use.**

George R Gallagher¹, Anisa Velasco¹, Vivian Medina-Hurtado¹

¹Dept. of Animal Science, Cal Poly San Luis Obispo, CA, USA

Wild birds have a direct effect on agricultural crops, food animal production, and zoonotic concerns. While many repellents and deterrents are used to mitigate damage from birds, lasers have demonstrated potential to accomplish the objectives under different conditions. The objective of this study was to evaluate the effectiveness of opportunistic laser administration from a handheld unit in repelling wild birds at a dairy, cattle feedlot, and feed storage area on a California University campus. Pre-laser treatment and post-laser treatment photographs were collected to determine the number and type of birds present. Laser application was accomplished by directing the beam at the ground level toward the birds in a lateral sweeping motion until a flight response was achieved or a 60-second period had elapsed. Additional data collected included time of day, treatment location, weather conditions, and laser treatment time. Analysis of pre and post-treatment paired photographs ($df = 1$; $n = 58$) indicated a decrease in the number of total birds ($X \pm SE$), (207.16 ± 23.45 to 137.72 ± 22.20 ; $p = 0.033$), blackbirds (214.40 ± 26.81 to 118.94 ± 23.17 ; $p = 0.008$), crows (23.85 ± 4.07 to 7.28 ± 1.47 ; $p < 0.001$) and waterfowl (29.70 ± 5.07 to 0.85 ± 0.49 ; $p < 0.001$). The laser treatment was not effective on pigeons (22.28 ± 3.70 to 13.13 ± 3.58 ; $p = 0.082$). No differences were observed in treatment effect due to technicians' analysis of photos ($p = 0.90$), treatment locations ($p = 0.44$), time of day ($p = 0.93$), temperature ($p = 0.98$), or weather conditions ($p = 0.56$). Approximately 75% of flight responses occurred within 15 seconds of laser exposure. Results suggest the handheld laser unit provided sufficient stimulus to induce flight for the most targeted birds, with limited effect on pigeons.

3:20 **Determining the applicability of new application strategies of zinc phosphide for managing ground squirrels**

Roger A. Baldwin¹, Ryan Meinerz¹

¹Department of Wildlife, Fish, and Conservation Biology, University of California, Davis, CA, USA

Burrowing rodents cause extensive damage in agricultural systems throughout California and the world. Rodenticides are commonly used as part of an Integrated Pest Management program to help control these burrowing pests. However, there has been increased concern about non-target exposure from these rodenticides in recent years, leading to substantial proposed changes to how these rodenticides might be used moving forward. These proposed changes may lead to the elimination of broadcast applications and spot treatments for zinc phosphide, instead focusing on bait stations and within-burrow applications moving forward. That said, we do not know how effective within-burrow applications of zinc phosphide are for California ground squirrels (*Otospermophilus* spp.) and Belding's ground squirrels (*Urocitellus beldingi*), nor do we know how efficacious bait stations containing zinc phosphide are for these same ground squirrel species. Therefore, we conducted a study from 2023–2025 to test the effectiveness of these application strategies across three sites for each of these ground squirrel species. Neither application strategy was effective against Belding's ground squirrels, with mean efficacy values of 10% and 17% for within-burrow and bait stations applications, respectively. We observed better results for California ground squirrels, with mean efficacy values of 73% and 76% for within burrow and bait station applications, respectively. These results are similar to previous studies that used more traditional broadcast and spot treatment application approaches, suggesting that within-burrow and bait station applications could provide a viable application strategy for California ground squirrels in the future. For Belding's ground squirrels, an effective grain-based bait remains elusive. To date, zinc phosphide-coated cabbage remains the only effective bait application strategy for this species.

3:45 **Lessons and innovations in beaver telemetry**

Stacie Robinson¹, John Callon¹, Anthony Hoffman¹, Wesley Smith¹

¹USDA Wildlife Services National Wildlife Research Center, Fort Collins, CO, USA

Beavers fill a unique role as ecosystem engineers with the potential to create valuable wetland habitat. Yet their constructions may also cause damage to habitat for some species as well as property, infrastructure, and other human concerns. Thus, understanding how beavers move, utilize their environment, and respond to management actions is crucial in mitigating damages to maximize benefits. Yet, beavers have been notoriously difficult to tag and follow with telemetry technology. Their streamlined anatomy, aquatic and nocturnal activity, canopy-covered riparian habitat and

social grooming behaviors seem designed to defeat tags that rely on secure attachment points, clear sky views, or solar charging. In concert with our wildlife damage management actions, Wildlife Services has conducted studies with varied goals and in diverse ecosystems providing a unique opportunity to evaluate and overcome some of the challenges in telemetry tagging beavers. In this presentation we will share lessons learned regarding beaver handling, tag application, and performance. We will discuss promises and pitfalls of varied telemetry technologies (VHF, GPS, Argos, and others) as they relate to different research objectives (spatial scale, follow time, level of human effort). While no technology solves all challenges, a number of innovations have made it easier to understand these animals and their use of aquatic environments.

4:10 Space use of altered landscapes by recolonizing California wolves

Christina Winters¹, Matt Hyde¹, Kaggie Orrick¹, Mauriel Rodriguez Curras¹, Arthur Middleton¹, Justin Brashares¹

¹University of California, Berkeley, CA, USA

Environmental and anthropogenic landscape-level alterations are forcing predators, prey, livestock, and humans to share space in novel ways that increase the potential for conflict. Following their broad-scale extirpation, wolves in California are returning to novel, human-use landscapes that are being increasingly affected by environmental disturbances. Herein, we analyzed habitat selection by wolves (n = 15) in four packs between 2017-2025 to understand the environmental drivers of wolf space use and response to disturbance. We modeled seasonal resource selection functions to analyze preference for habitat types and individual variation in pack and wolf behavior related to prey density, wildfire intensity, and rangelands. Our intermediate analysis revealed, despite slight seasonal differences, habitat type was only marginally predictive and highly variable. Our models indicated that prey presence, both native and domestic, and vulnerability is key to describing wolf space use. Our preliminary findings indicate a negative relationship between deer and cattle. As deer numbers increase, selection for areas of higher cattle density decreases and vice versa. We also found that deer density has the potential to mediate response to disturbance. As deer density numbers decrease, wildfires have the potential to exponentially alter wolf space use towards areas of higher cattle density. With the largest human population in the US and livestock consistently intermixed with native prey, wolves are returning to a very different California than they once may have known. Our results provide insight into how California wolves might respond to landscape alterations and thus, predict future patterns of recolonization and conflict.

4:35 Using education to change knowledge on wild horse management in youth

Laura K. Snell¹, Kimberly Dorsey², Steven Price², Kalen Taylor², David F. Lile¹, Jessie Hadfield²

¹University of California Cooperative Extension

²Utah State University

More than just horses, Mustang Camp provides hands-on, cross-disciplinary experiences to audiences unfamiliar with the controversial topics of wild horses, their management, and rangelands. There are currently over 73,000 horses on rangelands in the United States, nearly three times the appropriate management level. Wild horses are a significant vertebrate pest on western rangelands in the United States, negatively affecting native wildlife, local ranching economies, and the future sustainability of this vast landscape. Mustang Camp curriculum, developed by a diverse group of western research and extension professionals, is designed to be implemented across the United States. To date, 118 youth, ages of 9-18, participated in eight camps across three states between 2021-2025. Youth travel to rangeland sites, conduct range monitoring techniques, visit with professionals, and learn about public and private land management. The program also includes visiting a Bureau of Land Management wild horse corral, viewing wild horses (and burros) on the range and participating in several workshops specifically about wild horses and their management. Through education, we aim to teach the next generation that management of vertebrate pests can be challenging and complicated, but also vital to ecosystem sustainability. Using pre and post surveys, we will show changes in knowledge over time. We will also share links to the curriculum.

Thursday, March 5 (AM)
SYMPOSIUM: COMMENSAL AND FIELD RODENT MANAGEMENT

8:15 Computational urban ecology of New York City rats

*Ralph E Peterson*¹, Dima Batenkov¹, Ahmed El Hady², Emily Mackevicius¹

¹*Basis Research Institute, New York, NY, USA*

²Max Planck Institute of Animal Behavior

Urban rats are highly adaptable, thriving in the dynamic and often inhospitable conditions of modern cities. Despite substantial mitigation efforts, they remain an enduring presence in urban environments, yet surprisingly little is known about the daily lives and behavioral strategies that underlie their success. Here, we conducted fieldwork on free-ranging rats in New York City, using thermal imaging and ultrasonic audio recordings. We apply cutting-edge artificial intelligence techniques to capture high-resolution movement patterns, animal size, and generate 3D reconstructions of foraging environments including subways, streets, and parks. We quantified periods of coordinated group movement and show that larger rats move faster than smaller rats and are more likely to participate in collective bursts. We recorded a diversity of vocalizations across social contexts and show that their acoustic features lay outside of the typical range of features reported in the laboratory. In addition, we document intriguing use of the classically negative affect 22 kHz call during foraging. Ongoing efforts build upon this framework to enable a comprehensive computational pipeline to integrate tracking of multiple animals, mapping of environments in 3D, automatic labelling of features of interest in the environment, and inference of cognitive strategies of animals using graph neural network modelling. The acquisition of future fieldwork data will be enabled by a custom camera trap featuring synchronized thermal/RGB imaging and ultrasonic microphone recording/playback. Together, this work provides a foundation for translating techniques and theories of rodent cognition from the lab to urban ecological settings.

8:40 Energy efficient homes for rodent control across cityscapes

*Gabriel I Gadsden*¹, Kristy M Ferraro², Nyeema C Harris³

¹*Yale University School of the Environment Applied Wildlife Ecology Lab, New Haven, CT, USA*

²Memorial University

³Yale University School of the Environment

Cities invest millions in rodent control to reduce public health risks, yet infestations remain persistent. Rodents thrive in urban environments due to reduced predators and abundant garbage. While sanitation and green space management are important, broader governance and structural interventions are needed. Because rodents are commensal and responsive to built environments, understanding how residential building efficiency influences populations is essential. We developed an agent-based model of urban brown rats and their predator, red foxes, using data from three neighborhoods in Philadelphia, Pennsylvania. The model varied housing conditions, retrofitting presence and duration, and the proportion of initially energy-efficient homes. Results showed that initial housing quality, retrofitting, and retrofit duration significantly reduced rodent populations. Retrofitting was most effective in neighborhoods with extensive park access and low commercial activity. Across neighborhoods, single, large efficiency initiatives achieved greater reductions than smaller, incremental efforts. Importantly, the costs of large-scale retrofitting were comparable to a decade of public health expenditures, suggesting that investments in building efficiency could offset near-term control costs. These findings demonstrate that system-level, infrastructure-based approaches can advance long-term rodent mitigation and provide co-benefits aligned with global sustainability priorities. Retrofitting initiatives not only improve housing and energy outcomes but also support integrated pest management, contributing to infrastructure innovation (SDG 9), reduced inequalities (SDG 10), and sustainable cities and communities (SDG 11).

9:05 **Effectiveness of the AVIX autonomic laser repellent system in behavior modification of Norway rats (*Rattus norvegicus*) in an infested poultry house**

George R Gallagher¹, Vivian Mendina-Hurtado¹, Anisa Velasco¹

¹Dept. of Animal Science, Cal Poly San Luis Obispo, CA, USA

Infestations of the Norway Rat (*Rattus norvegicus*) in confinement type agricultural systems can result in considerable damage to physical structures, electric wiring, feed consumption, contamination, as well as serving as a pathogenic reservoir. While poisoning is a primary tool for control, secondary poisoning of treated baits by non-target animals suggests the need for alternative methodologies to reduce rodent damage. The objective of this study was to determine the repellent potential of the AVIX Autonomic Laser System, developed to repel birds, on Norway rats within an infested unused laying hen building. Within the hen house, five, 1m² sampling grids, 3m apart, were established to evaluate rodent fecal pellet counts within each of two aiseways separated by laying hen battery cages. Within each aisleway, two of the sampling grids were provided with 2.0 kg of pelleted poultry feed each 72h in plastic trays. Remote game cameras were used at those feeding sites to monitor activity. Following a preconditioning period, the AVIX Autonomic Laser was programmed to deliver the high intensity beam transversing the length of aisleway 10 times (69 sec), each 5 minutes, over a 14-day treatment for each respective aisleway. Across the preconditioning and the two treatment periods there were no changes in fecal pellet counts among sampling grids ($p>0.05$), feed consumption ($p>0.05$), average number of rats/photo ($p>0.05$) or average number of photographs taken per 24h ($p>0.05$). Results of this study suggest that administration of a laser in a simplistic preprogrammed manner was not effective in altering the behavior of rats.

9:30 **Smart sensor system for rodent detection and monitoring**

Zhongli Pan, Department of Biological and Agricultural Engineering, University of California, Davis, CA, USA

Rodent infestation poses a significant threat to orchards, food storage facilities, and warehouses, leading to substantial economic losses and contamination risks. Traditional monitoring methods, such as manual inspection and mechanical traps, are labor-intensive and often ineffective in providing early warnings. The new SmartProbe sensor system recently developed at UC Davis and Aivision Food provides a new way for early detection of rodents and notification, which enable for developing effective rodent control measures. The system integrates advanced wireless sensor technologies and Internet of Things (IoT) connectivity to enable continuous, automated monitoring and notification. The system utilizes a network with motion sensor to detect rodent activity in real time. Detected events are transmitted wirelessly to SmartProbe APP on mobile devices and computers for visualized alerts, allowing for rapid response and preventive control measures. The system can be operated under both WIFI and Offline Modes. The smart sensor can be easily attached to various existing rodent traps, which allow the existing facility to easily adapt the new technology. The research results showed high accuracy and has been used in food industry. The smart sensor approach enhances pest management efficiency, reduces human inspection cost and contamination risk, and contributes to safer and more sustainable agricultural and food production.

10:15 **Rodent and tick baits for control of pest rodents and parasitizing disease vectors: a method to prevent rodent and vector-borne diseases.**

David Poche¹, Richard Poche¹

¹Genesis Laboratories, Inc., Wellington, CO, USA

A promising alternative approach to conventional pest control practices is the use of a bait containing a rodenticide and acaricide/insecticide, in combination, to control rodents and infesting ectoparasites concurrently. Rodents serve as zoonotic reservoirs for a number of pathogens, including those responsible for plague and Lyme disease. Eliminating rodents through rodenticide usage, without taking into account medically-important vectors, can result in ticks and fleas leaving the deceased hosts in pursuit of an alternative blood source, increasing the risk of disease transmission in humans. In the United States, previous research has demonstrated the usefulness of a low dose acaricide-only bait (fipronil) in controlling *Ixodes scapularis* ticks feeding on white-footed mice, the respective vector and reservoir host for the Lyme disease bacterium. However, the association of mice and rats with diseases such as hantaviruses, as well as economic and agricultural damage, may encourage some homeowners to prefer to remove mice from their properties. A combination rodent and ectoparasite bait may present a useful alternative to encourage additional

community participation in integrated pest management. The purpose of this research was to evaluate the use of a rodent and tick bait (0.025% warfarin, 0.005% fipronil) in controlling white-footed mice and *I. scapularis* larvae. We evaluated the use of rodent tick bait in controlling white-footed mice in a laboratory choice test and in controlling *I. scapularis* larvae infesting treated white-footed mice in a simulated field choice test. Treatment resulted in 100% mortality of white-footed mice during 15-day exposure and prevented 100% *I. scapularis* larvae from blood feeding to repletion during 4-day exposure. All treated mice being parasitized with ticks had fipronil sulfone detectable in plasma. The results led to Environmental Protection Agency registration (Reg#. 72500-28) and suggest that a combination rodent and ectoparasite bait could be a useful addition to integrated tick management programs.

10:40 **Utility of Drones and AI for monitoring ground squirrel burrow systems**

Sean Hogan, UC ANR IGIS, Shingle Springs, CA, USA

California ground squirrels (*Otospermophilus* spp.) cause extensive damage to water-holding structures such as dams, levees, and irrigation canals through their extensive burrowing activities. As such, there is very little tolerance for their burrow systems in these structures, but finding their burrow systems and removing offending ground squirrels is very time consuming and costly for government agencies and private industry tasked with maintaining these structures. Identifying more efficient strategies for detecting ground squirrel burrow systems would provide substantial aid to these groups who are limited by financial and personnel resources. In an attempt to identify a quick, effective monitoring strategy, we tested the utility of drones and associated artificial intelligence driven visual recognition software to effectively monitor ground squirrel activity along dams, levees, and irrigation canals in California. To accomplish this, we utilized a red-green-blue (RGB) camera operated from a drone to collect imagery of ground squirrel burrows on water-holding structures. We then used software developed by Alta Innovation Solutions (AIS), as well as TextSAM, comprised of a combination of open-source Grounding DINO and META AI's Segment Anything computer vision models, within ArcGIS Pro, to determine their effectiveness at identifying ground squirrel burrow entrances. In preliminary tests, both models were somewhat effective at identifying burrow entrances, however, their classification accuracies varied substantially between sites and were generally less accurate than hoped. Nonetheless, the classification systems highlighted in this project can provide a general overview of ground squirrel burrow entrances that may be useful for monitoring trends in burrowing activity, and further refinement of these detection methods, along with more ideal timing of seasonal image collections, should increase accuracies and the value of this monitoring strategy in the future.

11:05 **Field and lab toxic bait trials to improve gray-tailed vole management**

Aaron Shiels¹, Hayden Hamby¹, Emma Hanslowe¹, Vanessa Petro², Nicholas Searfus¹, Danika Spock¹, Jimmy Taylor¹

¹*USDA APHIS Wildlife Services National Wildlife Research Center, Fort Collins, CO, USA*

²*Oregon Department of Forestry*

Two major challenges with gray-tailed vole (*Microtus canicaudus*) damage management in the Oregon grass seed industry are that zinc phosphide (ZnP) is the only approved rodenticide for use, and the four formulations do not appear to be consistently palatable and effective. In the last five years, we have completed a suite of field and laboratory trials with the intent of improving vole damage management. Our trials have included: 1) efficacy and palatability tests with the four registered ZnP baits, 2) attempting to improve ZnP bait palatability by coating the baits with powdered peanut butter and cheese, and 3) testing anticoagulant baits that have potential to be registered and used operationally if they are proven safe and effective in lab and field trials. Our summer 2021 field trials demonstrated that the four ZnP baits were not consistently attractive to voles, as cameras showed that many voles passed baits without consuming them, and the vole relative abundances on each farm did not consistently decline following toxic bait applications. Coating ZnP bait with powdered peanut butter and cheese did not improve palatability or mortality with lab-reared voles as mortality was high (75-100%) in coated and uncoated groups, yet field trials revealed voles preferred coated (44% removed in 24 hours) over uncoated baits (<1% removed in 24 hours). In the laboratory, anticoagulant baits (chlorophacinone and diphacinone) were equally palatable and effective as ZnP baits, resulting in at least 90% mortality for each bait type using EPA methodology. We recommend that these anticoagulant baits are pursued for potential registration for gray-tailed vole management in Oregon and that additional bait trials continue to identify the most promising baits and baiting strategies to improve vole management.

11:30 **Mapping agriculture conflicts with gray-tailed voles via survey of Willamette Valley farmers**

Dana Sanchez¹, Katherine R. McLaughlin², Lydia D. Newton²,

¹Oregon State University Dept Fisheries, Wildlife, & Conservation Sciences, Corvallis, OR, USA

²Oregon State University Survey Research Center

Species of voles and lemmings among within several Genera (e.g., *Microtus*, *Clethrionomys*, *Lemmus*) are implicated in agricultural losses across the globe. These species are particularly problematic due to dramatic population fluctuations, whose magnitude and unpredictability offer significant threat to agricultural production, profits, and planning (e.g., Jacob et al. 2020, Andreassen et al. 2021). We conducted an online survey (OSU IRB HE-2024-1250) December 2024-March 2025, of farmers and agronomists familiar with impacts of gray-tailed voles (*Microtus canicaudus*) on crops grown in Oregon's Willamette Valley. We sought to understand how farmers and agronomists perceived vole pressure to have varied across crops, years (2019-2024), and location (county). Further, we sought to identify which crops sustained greatest economic impact, to calculate lost value and percentage of crop in average- compared to high-population years and to estimate crop-specific per-acre investment in vole management. We also queried farmers on which management tools and approaches had been used, and which proposed or potential solutions they would consider using, along with willingness-to-pay for those solutions. There was no sampling frame for this study because we recruited via convenience sampling of participants via Extension stakeholder networks and mailing lists, and commodity grower conferences and workshops. We retained 186 responses for analysis, of which 158 identified as farmers and 28 as agronomists or advisors to farmers. Major crops were well-represented. When asked which crops received negative vole impacts, farmers selected grass grown for seed (40%), wine grapes (20.6%), and orchard crops (12.3%) most often, but some farmers also identified pasture and forages (7.7%), vegetables, and nursery plants (3.9%). Operation types of vole-impacted crops included conventional (55.5%), organic (23.9%), and additional combined or transitional types. Intriguing variations in reported vole pressure severity across intersections of county x year and crop type x year were striking and warrant additional investigation.

Thursday, March 5 (AM)

SYMPOSIUM: WORKING DOGS AND WILDLIFE

8:15 **Wake Atoll Rat Eradication –rodent detection dogs used to inform decision making and confirm success**

Tyler Bogardus¹, Thomas Hall², Miriam Ritchie³, Lisa Kamae⁴, Mark Vick (Working Dogs), Paul Roberts¹, Aaron Collins¹, Darcie Bellanto (DOC)

¹USDA-WILDLIFE SERVICES, Kapolei, HI, USA

²Island Conservation

³Canine Conservation Pest Detection Dogs

⁴Conservation Dogs of Hawaii

In 2024, the Wake Atoll Rat Eradication Project (WAREP), led by USDA Wildlife Services, Island Conservation, and the U.S. Air Force, targeted Polynesian rats (*Rattus exulans*) and white-throated woodrats (*Neotoma albigula*) for removal from the atoll. Following aerial and ground broadcast applications of Brodifacoum-25W, monitoring confirmed survivors of both rat species, prompting a shift into an adaptive, campaign-style response phase. The decision to incorporate trained rodent detection dogs and handlers was based on a need to increase sensitivity, spatial coverage and real-time decision support in a strategic approach to cover the entire atoll. Significant challenges included the abundance of residual rodent signs left behind by a high-density population creating a complex odor landscape. These aged scents complicated dog indication interpretation often triggering ambiguous alerts. The extreme heat and humidity of Wake Atoll posed risks of heat stress for dogs which required handler experience and adaptive management. Dog indications were classified using a structured scale (weak, moderate, strong) reflecting how odor presents in the environment and characteristic canine behavioral responses to differing levels of scent availability. Secondary dog teams were deployed to cross-verify original indications and strengthen confidence in classification. Moderate and strong indications triggered targeted management response actions including cameras, traps, bait and air rifles equipped with thermal optics. Dog indications directly informed response actions leading to targeted removals. Additional indications provided project managers with high-resolution real-time information on where the final remaining rat individuals were, which assisted the decision-making process for allocating resources. Finally, the

subsequent absence of indications provided critical evidence supporting proof-of-absence models. The integration of detection dogs, GIS-linked tracking, and adaptive deployment strategies significantly improved confidence in the final eradication outcome. Results demonstrate that well-trained detection dog teams can be decisive tools for achieving success in complex rat eradications.

8:40 Assessing the effectiveness of three carcass search approaches for reducing secondary exposure risk associated with rodenticides

Roger A. Baldwin¹, Ryan Meinerz¹, Theresa Becchetti², Jhalendra Rijal², Sheila Barry³

¹*Department of Wildlife, Fish, and Conservation Biology, University of California, Davis, CA, USA*

²*University of California Cooperative Extension, Modesto, CA*

³*University of California Cooperative Extension, San Jose, CA.*

Many rodents, including California ground squirrels (*Otospermophilus* spp.), cause extensive damage to California agriculture through direct crop loss, by posing as a potential food safety risk, and through damage to farm equipment and farm infrastructure. Rodenticides are commonly used to manage ground squirrels due to their high efficacy and cost-effectiveness, but concerns about secondary exposure of nontarget scavengers has led to several proposed actions to substantially limit their use. One of these proposed actions calls for conducting carcass searches at regular intervals to remove carcasses from the landscape. However, the effectiveness of these carcass searches is unknown, nor has the fate of carcasses been thoroughly investigated. Such information is vital to better inform regulations targeted at reducing secondary exposure risk. Therefore, our objective for this project was to determine the accuracy of carcass searches using scent detection dogs as well as human observation conducted via walking and driving surveys. We randomly placed carcasses across 4 rangeland and 4 orchard sites (20-22 carcasses per site) in the Central Valley, California, during summer 2025 to conduct tests. Although the effectiveness of each search approach differed across both rangeland and orchard sites, overall, scent detection dogs were most effective at locating carcasses (n = 54), followed by walking (n = 31) and driving surveys (n = 15). Carcasses persisted for an average of 1.99 days (SE = 0.14) across all study sites, with coyotes (*Canis latrans*) the primary scavenger. Although scent detection dogs were most effective at locating carcasses, all techniques failed to detect a substantial portion of the dead ground squirrels. The high cost and subsequent lack of effectiveness observed with carcass searches, combined with the short life-span of carcasses on the landscape, draws into question the value of carcass searches following rodenticide application programs.

9:05 Expanding the vertebrate management toolkit: integrating conservation detection dog teams on islands, urban systems, and anywhere in between.

Pete Coppollilo¹, Mark Vick¹

¹*Working Dogs for Conservation, Bozeman, MT, USA*

This presentation introduces conservation detection dog teams to the Vertebrate Pest Conference community, highlighting how their capabilities can complement and expand current management tools across island and urban systems. The session will outline the fundamentals of canine detection, how dogs work, their strengths and limitations, and factors to consider when determining whether detection dogs are an appropriate fit for a given objective. It will also provide practical guidance for researchers, managers, and pest control professionals on collaborating effectively with canine teams. Field examples from urban and island projects will illustrate lessons learned in program design, interagency coordination, and long-term capacity building. For more than 25 years, Working Dogs for Conservation (WD4C) has advanced the field application of detection dogs to support conservation, research, and vertebrate management worldwide. Drawing from nearly a decade of focused work in rodent detection, island protection, and urban Integrated Pest Management (IPM), WD4C has refined specialized training and deployment methods that combine ecological understanding with operational practicality. These approaches emphasize precise odor imprinting, rigorous field validation, and adaptive search strategies responsive to each target species and environment. By sharing insights from decades of applied fieldwork, WD4C aims to expand awareness of how conservation detection dog teams can enhance vertebrate management strategies and strengthen early-detection and prevention capacity across diverse settings.

9:30 **Rethinking rodenticide use through a wildlife-management lens—integrating K9 Detection and Abatement**
Kimberly Camera, Urban Canine Pest and Wildlife Solutions, Windsor, South Carolina, USA

When asked about my stance on rodenticide use, my answer is simple: I am not fundamentally opposed to rodenticides. My concern is how frequently they are deployed without the ecological data required to justify them. Too often, rodenticides are used reactively—triggered by visible signs of activity—rather than through informed assessment and structured evaluation. Effective rodent management requires a measured, science-driven workflow. Before considering any rodenticide, professionals should evaluate potential resistance, conduct at least 48 hours of activity observation, document runways, use cameras to validate movement patterns, and employ pre-baiting to confirm feeding behavior. Understanding carrying capacity, site fragmentation, and maternal colony locations is essential in determining whether rodenticides are even appropriate. Deploying bait boxes without this foundation compromises both efficacy and environmental safety. This lecture expands that framework by introducing K9 rodent detection and K9 rodent abatement as essential components of modern wildlife-based rodent management. Detection dogs reveal what technicians often cannot—hidden runways, harborage pockets, micro-populations, nest chambers, and concealed pathways—dramatically accelerating diagnosis and reducing guesswork. Abatement dogs then provide a rapid, humane method of reducing populations to non-detectable levels, allowing exclusion, sanitation, trapping, and—when warranted—rodenticides to work more effectively. We will also explore our air-sampling detection system, designed for areas where dogs are not approved or where additional verification is needed. The system’s effectiveness—especially when paired with canine detection—relies on two key scientific principles that will be examined during the session. Reframing rodent control as wildlife management within built environments encourages thoughtful evaluation of population ecology, habitat modification, non-target risks, and long-term ethical considerations. By integrating K9 detection, K9 abatement, air sampling, and ecological analysis alongside pest-management professionals, we strengthen outcomes, reduce environmental impact, and build a more sustainable future for rodent control.

10:15 **An overview of livestock guardian dog research and extension programming in California**

Dan Macon¹, Laura Snell², Tracy Schohr³, Carolyn Whitesell⁴, David Lile⁵

¹UC Cooperative Extension, San Andreas, CA, USA

²UC Cooperative Extension, Modoc County, CA, USA

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⁴UC Cooperative Extension, San Mateo County, CA, USA

⁵UC Cooperative Extension, Lassen, Plumas, and Sierra Counties, CA, USA

As California wildlife management policy and public perception about predator and wildlife management continue to evolve, commercial and backyard livestock owners are increasingly adopting nonlethal livestock protection tools that can reduce predator losses in a cost-effective manner. As a result, interest in using livestock guardian dogs (LGDs) in all types and scales of livestock production systems continues to grow. To address this need, county-based cooperative extension academics have developed a robust portfolio of research, real-world demonstration, and educational programming designed to help livestock producers increase the successful use of LGDs. On the research front, this includes using global positioning system collars and camera traps to assess interactions between predator and non-predator wildlife and LGDs. Additional research efforts developed a framework for evaluating site-specific conditions relative to LGD effectiveness, as well as analyzing the economics of using LGDs in commercial production settings. County-based extension advisors also developed real-world demonstrations regarding bonding LGDs with cattle and using virtual fence technology to manage LGDs in extensive settings. Finally, advisors have collaborated across California and the western United States to extend research-based information on LGD puppy selection, bonding and training techniques, and LGD management through fact sheets and long-form publications, webinars, and field days.

10:40 **Evaluating LGD breeds and their efficacy at protecting livestock and people**

Julie Young¹, Danny Kinka², Wesley Sarmiento³

¹Utah State University, Logan, UT, USA

²American Prairie Reserve

³University of Montana

The recovery of apex predators in the American West presents renewed challenges to livestock producers and rural communities. Livestock guardian dogs (LGDs) are widely used for protecting livestock from depredation, but the breeds first introduced in the United States were selected to prevent depredation by mesocarnivores, and these breeds have been less effective than desired against these apex predators. Recovery of apex predators has also created novel conflict scenarios between people and apex carnivores. To reduce conflicts, we must identify which LGD breeds are most effective against apex predators, understand how LGDs interact with predators and other wildlife, and determine the conditions LGDs under which LGDs perform best. We conducted research on working ranches and farmsteads to address these questions. This talk highlights findings from two experimental studies evaluating LGD breed differences and their efficacy at protecting livestock and people from apex predators.

11:05 **Livestock guardian dogs and virtual fencing, matchmaking old technology and new technology**

Dan Macon, UC Cooperative Extension, San Andreas, CA, USA

Thursday, March 5 (PM)

CONCURRENT SESSION: OTHER RODENT MANAGEMENT

1:25 **Field efficacy trial for a new diphacinone oat bait for black-tailed prairie dog management**

Aaron Shiels¹, Danika Spock¹, Jesse Townsend², Justin Cooper², Emily Ruell²

¹USDA APHIS Wildlife Services National Wildlife Research Center, Fort Collins, CO, USA

²USDA APHIS Wildlife Services Oklahoma

Prairie dogs (*Cynomys* spp.) are often considered agricultural pests, yet they also damage property and natural resources, and at times they carry fleas that are vectors of bubonic plague. The U.S. Environmental Protection Agency (EPA) classifies prairie dogs as public health pests and requires product performance data to support registration of new pesticide products for them. Toxic baits are one tool used to manage prairie dogs. Zinc phosphide baits are not always effective due to their strong odor and taste that has hampered bait palatability for some rodent species. As an alternative baiting option to zinc phosphide, first-generation anticoagulants, such as diphacinone, may be an effective prairie dog management option. This study tests whether a Neogen diphacinone oat bait can be safely and effectively used to manage black-tailed prairie dogs (*C. ludovicianus*) to support its future registration with the EPA. We established a treatment site and a control site in prairie dog colonies in Oklahoma. After two applications of the test bait to the treatment site, spaced 7 days apart, applied at least 6 inches into prairie dog burrows, and correcting for pre- to post-application abundances using the control site, the diphacinone test bait resulted in a 86% reduction in prairie dogs active aboveground using binocular counts, 87% reduction in number of burrows reopened after 24 hours, and 86% reduction in number of burrows reopened after 48 hours. There was only one carcass observed during carcass searching that followed bait applications, and that carcass was a black-tailed prairie dog that was discovered in the treatment site. No other adverse effects were observed on the treatment or control sites. Neogen has submitted these data to the EPA and expects this new product will be registered for operational use in 2026.

1:50 **Conflict with prairie dogs is one of the most challenging kinds of human -wildlife conflict to address on the Western Grasslands**

Lindsey Sterling Krank¹, Cam Saunderson², Emma Halaburt²

¹Humane World for Animals, Boulder, CO, USA

²Colorado State University

As a keystone species and ecosystem engineer, prairie dogs have experienced a dramatic decline of at least 95%. It is now essential to seek out solutions and alternatives to lethal management practices for both the species and their

associates. The Case Studies for Coexistence reviews both successful and unsuccessful sites, offering practical techniques, stories, and lessons that can be applied across the species' range.

Informed by Homes on the Range's results and publications, we selected sites with the Highest Conservation Potential that span private lands, land held in trust and federal lands. Each site's case study is formatted to include the story, partners, management goals, ecological context, coexistence strategies used, maps, photos, a score on Zimmerman's levels of conflict over wildlife, lessons learned and key quotes from the boots on the ground.

The three study sites include the Southern-Plains Land Trust, the U.S. Army Chemical Materials Activity-West and the Thunder Basin National Grassland. The presentation will summarize collaborative work that incorporated diverse perspectives on landownership, conservation, and management goals to guide future efforts in addressing humane wildlife conflict across the black-tailed prairie dog range.

2:15 **Managing black-tailed prairie dogs using GonaCon-prairie dog contraceptive vaccine with or without removal**

Jason Bruemmer¹, Aaron Shiels¹, Nathan Beard¹, Matthew Berta¹, J. Callon¹, S. Cook¹, M. Freihunt¹, E. Hanslowe¹, S. Robinson¹, D. Spock¹

¹USDA APHIS Wildlife Services National Wildlife Research Center, Fort Collins, CO, USA

Black-tailed prairie dogs (*Cynomys ludovicianus*) cause unwanted levels of herbivory and burrowing that result in conflict with land managers and owners. Contraceptive use is attractive for wildlife management yet when used alone may not reduce populations. GonaCon was recently registered by the EPA for controlling prairie dog fertility in urban/suburban settings and natural areas. In 2024 we tested whole-colony treatments of both sexes with GonaCon in the following treatments: 1) GonaCon only, 2) cull 75% of the colony+administer GonaCon, and 3) no culling or GonaCon. At Bluff Lake Nature Center (BL) and Lakewood Parks (LP), prairie dogs were counted in 2024 (Pre-treatment) and in 2025 (Post-treatment) during May-July. Each colony was counted multiple times simultaneously by multiple people. The highest counts for juveniles and adults were used in our analysis, which represents a minimum number known alive for each class (adults, juveniles). Colonies treated with GonaCon resulted in high reduction in juvenile populations. For LP GonaCon only colony, juveniles dropped to 2.7/ha from 25.1/ha, while the control colony went from 5.8 juveniles/ha to 4.2 juveniles/ha. The 75% cull+GonaCon LP colony experienced a >50% reduction in juvenile density (12.3/ha to 5.3/ha) despite an increase in adults at the site (14/ha to 24.6/ha). It was noted that prairie dogs had begun to re-establish on the periphery of this colony, which may cause any current treatment effects to be overwhelmed by an increase in reproductive immigrants. BL, which is the colony closest to a closed population, had a much more effective 75% cull+GonaCon treatment as there were no juveniles observed following treatment and the adult population had been greatly reduced (22.7/ha to 6.7/ha). These data suggest that although effective alone, treatment in conjunction with removal offers a more immediate and potentially longer-lasting population change.

2:40 **When pests are also species of conservation concern: Strategies and tools for effective prairie dog (*Cynomys* sp.) management**

Courtney Duchardt¹, Gabriel Barrile², Ana Davidson³, Bort Edwards³, David Augustine⁴, Lauren Porensky⁴

¹University of Arizona, Camp Verde, AZ, USA

²University of Wyoming-Casper

³Colorado Natural Heritage Program - CSU

⁴USDA-ARS

Many vertebrate pests are either non-native or extremely abundant, meaning that management focuses solely on suppression of these species. However, in a few cases, a given species may be considered both a pest and species of conservation. One such example is the prairie dog (*Cynomys* sp.); in the state of Wyoming, black-tailed prairie dogs (*C. ludovicianus*) are considered a noxious pest by the Wyoming Weed and Pest Association, but a Tier 2 Species of Conservation Need in the state's Wildlife Action Plan. Both designations have merit, as high prairie dog numbers have been linked to reduced livestock gains in some locations, and the species is a critical ecosystem engineer that provides habitat for myriad other wildlife, including the federally-endangered black-footed ferret (*Mustela nigripes*). In such cases, efficient and effective management becomes extremely complex; if conservation dollars are put towards increasing the species near efforts to eliminate it, this can represent inefficient use of funds and makes gauging management efficacy difficult. Further, the tools encouraged and available for both control and conservation of prairie

dogs vary from state to state, making broad-scale coordination and comparison challenging. Here, we summarize both conservation and pest status of the three non-federally protected prairie dog species in each US state, as well as existing resources for both conservation and control. We also present a publicly accessible, web-based decision-making tool, PDOG MAPR. This tool allows managers to upload shapefiles of black-tailed prairie dog colonies and corresponding annual weather data, then uses a predictive model to forecast population growth or decline under three management scenarios: no intervention, lethal control (“control”), and mitigation efforts designed to reduce the occurrence of sylvatic plague (*Yersinia pestis*) (“conservation”). This tool can help support coexistence and efficient resource use in landscapes where a vertebrate pest is also a species of conservation concern.

POSTER SESSION
Wednesday, March 4 (6:30-8:00 PM)
Location: Salon E
Session Chair: Roger Baldwin, University of California Cooperative Extension

Evaluating an alternative rodenticide for county use: a data-driven pilot study

Jordan Key, County of San Diego Department of Agriculture, Weights and Measures

In response to growing concerns about non-target wildlife effects and a commitment to Integrated Pest Management, in 2021 the County of San Diego Department of Agriculture, Weights and Measures (AWM) initiated a 20-week pilot study to assess the efficacy and operational viability of a non-anticoagulant alternative, Selontra® (Cholecalciferol), compared to the County's standard rodenticide, Diphacinone. The goal was to explore alternative treatment options while maintaining effective rodent suppression to protect County staff and the public. This pilot was initiated and completed prior to state legislation restricting the use of anticoagulant rodenticides. Three County facilities with established rodent activity and operational comparability were selected. Two served as test sites using Selontra; the third remained a control site using Diphacinone. Baseline data on rodent population activity and bait consumption were collected for the first four weeks. Rodent activity was recorded using non-toxic bait lures and tracking tunnels, with each tracking tunnel scored as either positive (activity detected) or negative (no activity detected). Bait consumption was monitored monthly through direct observation and weight approximation. All bait station servicing times, product usage, and rodent-related complaints were tracked and logged. This project emphasized a field-based, data-driven evaluation strategy that allowed for quantifiable comparisons of rodenticide efficacy. Results were analyzed to assess correlations between rodent activity, bait consumption, complaint volume, and labor inputs across the three sites. Findings demonstrated that Selontra performed comparably to Diphacinone in controlling rodent populations, with similar patterns of bait consumption and declining tunnel activity. This pilot enabled AWM to generate localized evidence to guide future pest management policy decisions, reduce non-target risk, and ensure regulatory compliance. By combining integrated pest management principles with data collection, this project serves as a replicable model for municipalities seeking environmentally responsible rodent control strategies grounded in scientific evaluation.

Managing vertebrate pests: protecting agriculture and engaging youth

Mark Nelson¹, Melanie Heaton¹, Kalen Taylor¹

¹Utah State University Extension

Vertebrae pests present a significant challenge for farmers and landowners in Beaver County, Utah. These pests include pocket gophers, ground squirrels, racoons and rock chucks. Their tunneling activity leads to economic losses through reduced crop yields, equipment damage, and costly pest control efforts (Baldwin et al., 2016). Beaver County Extension implemented a youth abatement trapping program. This program aimed to educate youth on safe and effective trapping techniques, and the importance of land stewardship. Additionally, it provided financial incentives, particularly for youth under 14 who lack traditional employment opportunities, while fostering outdoor engagement. We have conducted this abatement program for the past three years. The program yielded substantial results: The youth have trapped 4438 gophers, 1083 ground squirrels, 581 rock chucks, and 348 racoons, collectively earning \$17,815. Agricultural producers benefited from an estimated \$200,000 in savings from reduced abatement costs and crop damage. Participants spent over 2000 hours outdoors, reinforcing hands-on conservation learning while reducing screen time. This abatement project has been so successful that the conservation districts have continued to fund this program. During the first year of the program, I was contacted by a local farmer who was so impressed that he bought 36 gopher traps for us to hand out participating youth. By integrating pest management with youth education and financial incentives, the program effectively reduced vertebrae pest populations, provided income for young participants, and strengthened relationships between the county, conservation districts, and youth.

Overnight in-the-trap harassment as a vulture management tool: site and space use outcomes for Black Vultures

Spencer Hudson¹, Eric Tillman¹, Bryan Kluever¹

¹USDA APHIS WS, Gainesville, FL, USA

The intensification of conflicts between people and wildlife worldwide has prompted the need to develop and test novel management tools. In the United States, conflicts stemming from the expansion of Black Vultures (*Coragyps atratus*) require mitigation methods that elicit aversive behaviors towards sensitive human-use areas. The objective of this study was to evaluate overnight in-the-trap harassment as a means of deterring Black Vultures from inhabiting infrastructural sites (i.e., hydroelectric dams and surrounding areas). Following nocturnal hazing and/or on-site release, we collected location data (>80-thousand fixes) from adult Black Vultures equipped with solar-powered GSM/GPS transmitters over a 30-day period. We performed recursion analysis to quantify conflict site use (return outcome, return time, revisit frequency, residence time) and fitted dynamic Brownian bridge movement models to estimate space use (50% utilization distribution). Doing so allowed us to compare movement patterns in the presence versus absence of treatment, which revealed no differences in our site and space use estimates. Our approach to overnight in-the-trap harassment was thus ineffective at deterrence and is not recommended as a vulture management tool in these settings.

A systematic review of feral swine incidents and response

Jackson VerSteeg¹, John Tomecek¹

¹Texas A&M University

Wild pigs (*Sus scrofa*), commonly called feral pigs, hogs, or swine, are the modern-day descendants of the Eurasian wild boar living outside its native range, escaped domestic swine (*Sus scrofa domesticus*) roaming free, and their hybrids. Wild pigs are a source of agricultural, ecological, and economic damages in the United States. Little is known about direct negative incidents between humans and wild pigs such as attacks on humans, wild pig-vehicle collisions (WPVCs), and zoonotic disease transmission. This is largely related to an unknown and inconsistent flow of reporting of such incidents. Publicly available data will be used from government records, as well as both mass and social media. This will allow us to document the extent that government agencies receive reports of negative, human-wild pig incidents and how these reported incidents are documented. Initial data collection from government records suggests that documentation quality varies highly among states. Initial data collection from media sources suggests that it contains documented incidents that do not exist in government records, but issues remain regarding validity and feasibility. The purpose of this study is to identify pathways and consistencies in reporting negative, human-wild pig incidents nationwide. Through data analysis, we hope to identify geographic areas facing increased occurrence of either wild pig attacks, WPVCs, and zoonotic disease transmission to help direct management. From an analysis of incident response and reporting, we will provide recommendations for streamlining incident reporting and increasing valid data collection and reporting.

Temporal responses of native and invasive rodents to sugarcane crop succession

Christian Kammerer¹, Hance Ellington², Moramay Naranjo³, Jens Jacob⁴, Aaron Shiels⁵

¹UF/IFAS Hendry County Cooperative Extension, University of Florida, Labelle, FL

²UF/IFAS Ona Range Cattle Research and Education Center, University of Florida, Ona, Florida

³Florida Crystals Corporation, Belle Glade, Florida

⁴Julius Kühn-Institut, Institute for Epidemiology and Pathogen Diagnostics, Münster, Germany

⁵USDA APHIS Wildlife Services, National Wildlife Research Center, Fort Collins, Colorado

Rodent communities, made up of the hispid cotton rat (*Sigmodon hispidus*), marsh rice rat (*Oryzomys palustris*), roof rat (*Rattus rattus*), and house mouse (*Mus musculus*), annually cause over \$20 million dollars in damage on South Florida sugarcane. Sugarcane fields mimic disturbance dependent grasslands with harvest reducing dense canopies to bare soil before regrowth from stubble. Understanding when rodents colonize fields and how community composition shifts during regrowth can improve control strategies. The objectives of our study were to determine when rats colonize sugarcane fields and how community composition changes throughout the season. We deployed tracking tunnel arrays (n =12) and snap trap lines (n =18) in conventional and organic fields in Palm Beach County, Florida from May 2025 to November 2025. Beginning in May, cotton rats were the dominant rat species whereas marsh rice rat

abundance was low until July. Throughout the study, roof rat abundance was low. In understanding when fields are colonized and the temporal changes in community composition, producers will be able to identify the drivers of this establishment and change. By identifying these drivers, producers can better implement targeted, cost-effective management practices.

Detection of helminth parasites (*Mastophorous muris* and *Taenia taeniaeformis*) in roof rats (*Rattus rattus*) collected from residential backyards in Orange County, California, 2023-2024

¹Laura Krueger, ¹Daisy Flores Rangel, ²Niamh Quinn, ¹Dave Taylor, ¹Amber Semrow

¹Orange County Mosquito and Vector Control District, Garden Grove, CA

²UC ANR

The Orange County Mosquito and Vector Control District (OCMVCD) conducts surveillance of roof rats (*Rattus rattus*) in residential areas of Orange County to identify and respond to potential public health threats. In 2024, OCMVCD identified the presence of two helminth parasites, *Taenia taeniaeformis* (cat tapeworm) and *Mastophorus muris* (a globally distributed parasitic nematode of rodents) in roof rats that were collected in residential backyards in Tustin and Irvine. The Irvine rat was collected by University of California Agricultural and Natural Resource staff in a residential backyard and presented with helminths encysted in the liver during necropsy. The Tustin roof rats (6 positive detections as of November 2025) were collected in lethal traps in response to reports of high rodent, squirrel, and cat activity at a large Homeowners Association (HOA). The worms were observed to exit the anus and mouth upon collection of lethal traps. To identify these rat-borne helminthiasis, DNA was extracted from representative specimens collected from both locations. The 18S and 28S rRNA genes were sequenced using 18S and 28S rDNA primer sets for next-generation sequencing (NGS)-based parasite detection. *T. taeniaeformis*, in roof rat hosts, presents a risk to domestic cats, which become infected by consuming infected rats. Although rare, humans can be infected by *T. taeniaeformis*. *M. muris* is a parasite of rodents and not considered to be of public health importance. This poster describes the methods used to speciate internal helminth parasites of roof rats and provides recommendations for Orange County residents concerned with roof rat infestations on their property.

Evaluating two widely used rodent control methods—culling and anticoagulant rodenticides—from a One Health perspective

Holly Gerberich, University of Exeter, Washington D.C., USA

Rodents (Rodentia) are among the most abundant and diverse mammals on Earth. Many rodent species live in close association with humans, livestock, and companion animals, acting as reservoirs and vectors for numerous pathogens and posing serious public health risks. This research evaluates two widely used rodent control methods, culling and the use of anticoagulant rodenticides (ARs), through a One Health lens, highlighting both their limitations and unintended consequences. Managing these populations, specifically synanthropic species, presents a “wicked problem” due to their adaptability and resilience. Evidence suggests that these methods of rodent population control can inadvertently exacerbate disease transmission, compromise ecosystem health, and pose risks to non-target wildlife and humans through bioaccumulation and accidental exposure. This research further explores several emerging alternatives that better align with One Health principles, including ecology-based rodent management (EBRM), localized fumigation with carbon monoxide, and fertility control strategies. Collectively, these approaches demonstrate that effective, sustainable rodent management requires balancing human, animal, and environmental health. Incorporating these alternatives into broader integrated pest management (IPM) programs would be a critical step toward mitigating zoonotic risk while adhering to One Health principles.

Relating livestock health and wild pigs on rangelands

Cheyenne Voorhies¹, Vienna Brown², Landon Schofield³, John M. Tomecek¹

¹Texas A&M University

²USDA APHIS WS

³East Foundation

Wild pigs (*Sus scrofa*) are an invasive species expanding their geographic range and population abundance across the United States. They are highly abundant in Texas, and increasing evidence shows an impact on animal agriculture

through predation and disease transmission. Wild pigs carry and transmit numerous viral and bacterial diseases along with parasites, many of which pose a threat to humans, livestock, and wildlife species. There is also increasing concern that wild pigs negatively affect livestock health through stress or exclusion from feed sources, leading to a decrease in animal health and profitability. This project aims to generate a comprehensive understanding of how wild pigs impact rangeland cattle operations in semi-arid climate regions by researching the potential that wild pigs negatively impact livestock health. Livestock health data will be collected over the course of four years from paired, independent cattle herds across a study property located in South Texas. As wild pigs are trapped, euthanized, and sampled for disease prevalence in one herd, the other herd will receive no wild pig removals. Camera grids will monitor the wild pig population and abundance in these paired operational units. The data collected from these paired units will be analyzed to gain an understanding of differences in cattle health and performance under varying levels of wild pig presence and disease prevalence. These findings can be used to model economic impacts on livestock operations and guide future strategies for managing wild pigs in semi-arid climate regions.

Highly pathogenic avian influenza surveillance in feral swine by Wildlife Services

Gregory A. Franckowiak¹, Michael Glow¹, Lindsey Howard², Dana Cole¹

¹USDA/APHIS/Wildlife Services/National Feral Swine Damage Management Program

²USDA/APHIS/Wildlife Services/National Wildlife Disease Program

Research suggests that weather patterns have potential to influence the transmission cycle of influenza viruses, including H5N1 highly pathogenic avian influenza (HPAI). This alteration of bird migration patterns may put HPAI-infected individuals in contact with novel hosts, facilitating virus spread to new species and geographic locations. While extensive HPAI surveillance and research focuses on wild and domestic birds, the growing number of mammalian HPAI infections suggests additional monitoring efforts should consider opportunities for novel virus emergence as a result of cross-species transmission. For example, in October 2024 the U.S. Department of Agriculture (USDA) reported the first detection of HPAI in a domestic pig within the U.S. This detection occurred in a backyard farming operation, having a mix of poultry, livestock, and swine, where cross-species transmission occurred. The detection of HPAI in swine is of particular concern, as pigs are considered “mixing vessels”, in which reassortment of avian and other influenza viruses can create a novel zoonotic variant, constituting significant risks to both agricultural and human health. The cross-species transmission, resulting in infection of a domestic pig, highlights the need for HPAI surveillance in their wild counterparts. Feral swine are a non-native species in the U.S., and their invaded range overlaps with habitats where HPAI-infected wild birds are known to inhabit, raising concern for disease spillover. To better monitor HPAI in feral swine, USDA Wildlife Services has collected over 9,300 serum samples from feral swine removed from the landscape in 31 states for antibody-based diagnostics, and over 330 nasal swabs from targeted U.S. counties in four states where HPAI detection in domestic or wild animals has occurred, or H5 antibody has been previously detected in feral swine. This poster will provide the most up-to-date report on Wildlife Services’ feral swine HPAI surveillance efforts and results in relation to each U.S. Flyways.

Feral swine trap site selection using gps telemetry and landscape characteristics in Central North Carolina

William Mayfield¹, Falyn Owens², Luke Dollar³, Christopher DePerno¹

¹North Carolina State University, Raleigh, NC

²North Carolina Wildlife Resources Commission in Raleigh, NC

³Catawba College in Salisbury, NC

Feral swine (*Sus scrofa*) present significant ecological, economic, and agricultural risks, exacerbated by difficulty in location and trapping owing to their intelligence, adaptability, and large home ranges. Traditional trapping practices can be expensive and labor-intensive, as well as counterproductive for trap-shy or disturbance- or encroachment-sensitive pigs. Optimized trap-site selection is essential for efficient and effective mitigation efforts. This project will field GPS-collared individuals, aka “Judas pigs,” to locate sounders and prioritize trapping zones in the Yadkin-Pee Dee and Cape Fear River Basins of North Carolina. GPS telemetry data, integrated with national land cover data in ArcGIS Pro, will facilitate identification of high feral swine activity zones, overlapping with forest cover and within 500 yards of water features. Preliminary hotspots will highlight additional areas where feral swine presence and habitat conditions overlap. This data will guide more efficient trap placement and increase operational efficiency in North Carolina and

implications of this study will be shared with regional and national practitioners to augment feral swine management throughout the country.

Foreign animal disease monitoring with the SQUEAL ON PIGS! CAMPAIGN

Ariel Mixon¹, Dana Cole¹, Michael Glow¹

¹USDA APHIS Wildlife Services; National Feral Swine Damage Management Program

Feral swine serve as persistent pathogen reservoirs for numerous diseases that have been eradicated from the domestic livestock industry (e.g., pseudorabies, swine brucellosis) and pose a substantial risk of exposure and spread of a foreign animal disease (FAD) such as African swine fever if introduced to the United States. Considering these risks, tools that facilitate early detection of emerging or introduced feral swine populations and/or early signs of a potential disease outbreak are crucial for effective management and disease risk mitigation. Therefore, the National Feral Swine Damage Management Program has collaborated with the Center for Invasive Species and Ecosystem Health at the University of Georgia to create and maintain a web-based reporting system known as Squeal on Pigs! to encourage the public to report sightings of feral swine. The Squeal on Pigs! campaign utilizes a mobile app powered by EDD Maps (Early Detection & Distribution System Maps) to pinpoint locations of feral swine sightings and/or feral swine morbidity and mortality reported by the public. Notifications of reports are received by wildlife managers, who then validate reports and implement an appropriate response if necessary. The Squeal on Pigs! tool may also be adapted to aid in an FAD outbreak emergency response by providing information needed for targeted disease mitigation strategies. This presentation will provide an overview of the Squeal on Pigs! campaign and its positive impact on feral swine disease-risk mitigation and discuss how to become a Squeal on Pigs! partner.

Rodenticide residues detectable in vertebrate species two years after a house mouse (*Mus musculus*) eradication attempt on a subtropical coral atoll

Carmen Antaky¹, Israel Leinbach¹, Jonathan Plissner², Beth Flint³, Wesley Jolley⁴, Benjamin Abbo¹, Hayden Hamby¹, Steven Hess¹

¹USDA National Wildlife Research Center, Hawaii Field Station

²USFWS Midway Atoll National Wildlife Refuge

³USFWS Marine Monuments of the Pacific

⁴Island Conservation

The use of anticoagulant rodenticides to eradicate invasive rodents from islands for the conservation of native biota has increased greatly in recent years. Although non-target consequences and persistence of residues in the environment are usually monitored during rodent eradications, every island has unique biological communities and environments that may respond differently. Brodifacoum-25D Conservation, a second-generation anticoagulant rodenticide, was applied on Sand Island, Midway Atoll to eradicate house mice (*Mus musculus*) and protect native seabirds in the Northwestern Hawaiian Islands. Following an eradication attempt, rodenticide residues can persist in the ecosystem longer than the period required to eradicate the target rodent population and may pose lasting risks to non-target species. Long-term rodenticide persistence varies across ecosystems and is relatively understudied. In this study, we evaluated the persistence of brodifacoum residues in fish, reptile, and bird species on Midway Atoll (Northwestern Hawaiian Islands) two years after a mouse eradication attempt. We collected 18 samples of the following species: western mosquitofish (*Gambusia affinis*), common house gecko (*Hemidactylus frenatus*), western cattle-egret (*Ardea ibis*), and Laysan duck (*Anas laysanesis*). Brodifacoum residues were found in all four of the species sampled. Our study demonstrates that trace levels of brodifacoum can persist in the tissues of vertebrate species for as long as two years following rodenticide application. These results provide important insight for evaluating non-target and environmental risks associated with rodenticide use on island ecosystems.

Case Study: foreign animal disease surveillance in feral swine in the vicinity of a dump site potentially containing contaminated garbage of international Origin

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Foreign animal diseases (FAD) such as African Swine Fever (ASF) and Classical Swine Fever (CSF) pose a major threat to our country's pork industry. Feral swine populations increase this risk because of access to and scavenging in dump sites that may contain incompletely treated contaminated garbage from affected countries. If infected, feral swine can rapidly spread these highly infectious diseases. The Wildlife Services (WS) National Feral Swine Damage Management Program collaborated with a variety of federal and state agencies to respond to a potential FAD incursion in June 2025. This case involved the discovery of regulated waste containing products of international origin dumped on the edge of a wildlife refuge. It was likely that this dump site contained waste from countries experiencing ASF and CSF outbreaks. With the risk of FAD pathogens at the waste site and a population of feral swine in the area, WS reacted quickly to complete feral swine removal and disease surveillance. Feral swine were euthanized, and diagnostic samples were collected for testing. Over the next several weeks, 61 individuals were removed from the landscape and sampled. Expedited testing was performed to detect the presence of ASF and CSF virus antigen and antibodies. All samples tested negative. This case is an example of a collaborative interagency response to a potential FAD incursion in feral swine. All agency partners worked quickly to assess the risk and initiate a response, ensuring appropriate communication channels were in place if a FAD was detected. Future operations will benefit from this opportunity to improve FAD response.

Swine brucellosis in wild pigs and its potential impact on the pork industry by USDA Wildlife Services

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The United States Department of Agriculture's (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) conducts large scale removal of feral swine within the United States. These invasive mammals are distributed across much of the U.S., and damage and disease risks associated with these animals are significant. Brucellosis is a zoonotic disease caused by the *Brucella* genus of bacteria that impacts wildlife and livestock species alike. While many different strains of *Brucella* are concerning for both human and animal health, *Brucella suis* (SB) is the strain of greatest concern for U.S. pork producers- as it results in central nervous system and reproduction issues for infected swine. SB is very rare in commercial domestic swine populations however, in feral conspecifics, this disease is present in much higher numbers. Feral swine disease samples collected nationwide by USDA's Wildlife Services are tested for SB at USDA's Federal Brucellosis Laboratory located in Frankfort, Kentucky. Our findings show a mean seroprevalence of 7.6% from feral swine samples collected between fiscal year 2016 and fiscal year 2024 (ranging from 5.5% and 14.5%). This presentation will highlight the most recent Wildlife Services feral swine removal and disease surveillance methods, accomplishments, and *Brucella* seroprevalence from across the U.S. Were *Brucella suis* to infect domestic herds it would not only cause losses for pork producers and possibly increase prices for the American people, but it would also likely affect US trade relations which would cause even more economic losses. With continuous removal and disease surveillance of feral swine in the U.S., Wildlife Services is proactively working to safeguard American pork production by minimizing disease spillover from feral to domestic swine populations and preventing future outbreaks of Brucellosis and other diseases of concern.

The use of livestock guardian dogs for swift fox conservation

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The swift fox (*Vulpes velox*) is short grass obligate species that once ranged from southern Canada to Texas. In Texas, swift foxes are considered a species of greatest conservation need (SGCN). Historically, swift foxes occurred in 79 counties throughout the Texas Panhandle and west Texas. Currently, the species only occurs in Dallam County with an estimated population of about 50-250 individuals. Predation by coyotes (*Canis latrans*) has been identified as a key

cause of mortality for swift foxes. Attempting to curb this, coyotes are often culled in areas where swift fox persist. Despite this effort, swift foxes continue to decline. Recently, livestock guardian dogs (*Canis familiaris*; LGD) have been proposed as a potential solution to this predation. LGDs have been used for centuries in Asia and Europe, and more recently in Africa, Australia, and North America, to reduce predation on livestock. Given that swift foxes and cattle (*Bos taurus*) tend to co-occupy shortgrass prairies, there may be a value-added benefit to the presence of LGDs with cattle where swift foxes exist. Thus, our goal is to determine if LGD presence in areas with swift foxes is correlated with an increase in swift fox space use and survival and decreases the use of such spaces by coyotes. We will deploy 2 pairs of LGD, affixed with GPS collars, among cattle grazed on various units in the Rita Blanca National Grassland in northern Texas. We will compare the collected spatial and temporal data of the LGDs with those collected from collared coyotes and swift foxes across the years of this study.

Avoidance and habituation responses of crows to a dancing scarecrow: a pilot study

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Wild animals destroy crops through consumption and trampling, and their defecation on or near crops can pose food safety risks. Birds are among the most challenging animals to exclude from agricultural fields; therefore, understanding bird avoidance and habituation responses is crucial for developing effective bird damage control measures. In recent years, the use of various movement-based deterrents such as scarecrows, kites, and decoys has become widespread. However, little information is available regarding birds' behavioral responses to these devices. In this study, we investigated the avoidance and habituation responses of wild crows to moving scarecrows at a large experimental feeding site established in the field. A blower-powered inflatable scarecrow ("dancing scarecrow") that produced large, unpredictable waving motions was employed as a movement-based bird deterrent. For outdoor evaluation, 25 feeders were placed at equal intervals within a test area measuring 20 m × 20 m. The scarecrow and a video camera system to monitor crow behaviors were positioned at the southern and northern ends of the test area, respectively. The scarecrow and cameras were operated remotely. The time from the start of each trial until all food had been removed by crows was recorded as an index of deterrent effectiveness. In the first trial, crows exhibited a markedly longer food consumption latency when the dancing scarecrow was present compared with the control condition. In contrast, during the second and third trials, the time required for food disappearance was nearly identical between the experimental and control conditions, indicating rapid diminishment of the initial avoidance response. These findings indicate that although movement-based deterrents can initially repel crows, their functional range may be limited to within 20 m and their effectiveness may decline extremely quickly, underscoring the need for continued research to develop deterrent systems that maintain efficacy over extended periods.

Exploring appropriate needle specifications for bird anti-perching devices in rock doves

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Rock doves *Columba livia* commonly inhabit urban environments such as train stations and buildings, where their droppings can cause sanitary and structural damage. A variety of needle-type anti-perching devices are widely used in Japan as a mitigation measure; however, their effectiveness is not always consistent or clearly understood. Although the effectiveness of needles or spikes as bird deterrents depends on the interaction between needle specifications (e.g., length and spacing) and the body size of the target bird species, fundamental information linking bird body size to the physical structure of needles or spikes remains limited. In this study, body size indices were measured in stuffed rock doves to determine appropriate anti-perching specifications for this species. Total leg length, body width, and chest girth were recorded from specimens in the zoological collections of the Central Research Institute of Electric Power Industry. Total leg length was defined as the sum of the femur, tibiotarsus, and tarsometatarsus. The average total leg length and body width of the rock doves were 14 cm and 10 cm, respectively. These results suggest that, if vertical needles are used, a needle length of at least 14 cm with spacing no wider than 10 cm is required to function as a physical barrier to perching. When multiple radial spikes are installed so that they overlap, the average chest circumference (32 cm) implies that a spike length of 17 cm or longer and spacing no wider than 17 cm could theoretically prevent doves from landing even in the gaps between spikes. Further experiments on live doves, both in

captivity and in the wild, will be necessary to evaluate the practical effectiveness of the calculated structural thresholds.

Use of automated telemetry to investigate rodent movement associated with vegetated ditches in agricultural settings

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Agricultural runoff persists as one of the most environmentally damaging byproducts of conventional agriculture. Vegetated ditches, which slow down and absorb nutrients through plant buffers, are a promising solution to reducing nitrogen load in runoff water. However, common practice when farming leafy green crops prescribes clearing vegetation within ditches to reduce rodent habitat due to food safety concerns. Despite these perceived risks, the relationship between vegetated ditches and rodent movement remains under-explored. I investigated the movement of rodents from agricultural ditches into crops in Monterey County, California using a novel automated telemetry system. Positional data for collared rodents were collected every 45 seconds to track precise nocturnal movements within a grid of radio receivers in each crop field and its adjacent ditch. While both vegetated and bareground ditches maintained populations of house mice (*Mus musculus*) and Gambel's deer mice (*Peromyscus gambelii*), vegetated ditches additionally contained California voles (*Microtus californicus*) and shrews (*Sorex* spp.). I fitted radio collars on 67 voles, 39 deer mice and 8 house mice over a two-year period. After collecting automated tracking data, I compared movements of rodents in vegetated ditches to those in bareground ditches, specifically focusing on frequencies of ditch crossings and maximum travel distances of rodents into crop fields. These findings are likely to be of interest to growers and policymakers concerned about the implementation of vegetated ditches in agriculture.