HUMAN WILDLIFE CONFLICT WORKING GROUP

Chair: Brian Wakeling (Montana)
Vice-Chair: Doug Brimeyer (Wyoming)

March 23rd, 2023
10:00 AM – 12:00 PM(CDT)
Majestic G – Conference
Center Upper Level

North American Wildlife and Natural Resources Conference

Minutes of the Meeting:

- **Call to Order/Review Agenda/Introductions (B. Wakeling/D. Brimeyer)**
  - Chairman Wakeling opened the meeting
  - 53 members and guests were in attendance

- **Approval of Minutes from the AFWA Annual Meeting (B. Wakeling)**
  - The minutes from the previous meeting (AFWA Annual Meeting, Fort Worth, Texas) were approved on the floor by a motion from the Chairman

- **Update: National survey on how agencies manage and fundwildlife conflicts (Lou Cornicelli/Terry Messmer/Bryant White)**

  - **Multi-state Conservation Grant Project Overview:**
  - Human-wildlife conflicts (HWCs) are increasing across the United States. State Wildlife Agencies (SWA) under the Public Trust Document have been given the authority to manage wildlife to include most of the species implicated in HWCs. Concomitantly, each SWA has different authorities, policies, levels of species protection, and most importantly, unique ways of funding and managing HWC mitigation programs. Little information is available summarizing how SWA fund and staff their programs. Given increased demands for a finite pool of funding, wildlife managers often compete for funds that could otherwise be used for other higher priority conservation needs. In essence, the HWC programs have largely become a SWA unfunded mandate.
  - In many cases, delegated authorities to manage HWCs are passed to local units of government or private individuals who are contracted to solve problems. In other cases, SWAs organize and participate directly in HWC mitigation programs. Some SWAs even compensate individuals financially for wildlife damage. As there is no 'one size fits all' approach to HWC management, it is critical for SWAs to learn from each other and develop programs that alleviate conflict in their respective jurisdictions. There is also a need to work with wildlife conflict managers to consolidate information into a single source.
  - **Support Needs:**
  - National list of Agency conflict managers so we can field a survey. We recognize this list may cross disciplines within the same Agency, so we are seeking as comprehensive accounting of staff as possible.
  - Thoughts on topics that are important to cover in the survey.
  - **Outcomes:**

- A final report with the analysis of the current status of human wildlife conflict authorities and obligations (such as, staffing and financial) will be prepared for distribution to all 50 state wildlife agencies. The document will follow the format like the WMI/Southwick Associates feral swine report.
- The Jack H. Berryman Institute is also participating in the project, and we will produce a publication from these efforts. We also anticipate preparing other forms of documentation that are beneficial to the states.

- **Research Team:** Association of Fish and Wildlife Agencies, Southwick Associates, Jack H. Berryman Institute, Montana Department of Fish Wildlife and Parks

- **Study Contact Information:**
  - **Bryant White,** AFWA, bwhite@fishwildlife.org
  - **Lou Cornicelli,** Southwick Associates, Lou@SouthwickAssociates.com
  - **Terry Messmer,** Utah State University, terry.messmer@usu.edu
  - **Brian Wakeling**, Montana Department of Fish Wildlife and Parks, brian.wakeling@mt.gov

- **Motion for approval of the manuscript on human-wildlife conflicts with coyotes in urban areas (B. Wakeling)**

  - Chairman Wakeling requested approval of the manuscript for submission to Human Wildlife Interactions Monograph series. This is the third product from HWCWG to be considered. The prior 2 are available on Digital Commons and have been downloaded a combined total of 1,787 times around the world (bears and deer). These manuscripts are not prescriptive in nature and are intended to serve as a resource for managers to determine the strengths and challenges of approaches that may be tailored for use in their jurisdiction.
  - The motion to approve the manuscript passed unanimously on the floor
  - Approval for submission from the Wildlife Resource Policy Committee was asked for and granted as well.

- **USDA-APHIS-Wildlife Services (Jessica Fantinato)**

  - National Wildlife Services Advisory Committee (NWSAC)
    - The Secretary of Agriculture recently approved (on 1/24/23) the reestablishment of the NWSAC. The NWSAC, first established in 1986, is a 20-member Federal Advisory Committee Act (FACA) Committee that advises the Secretary on policies and program issues necessary to manage damage caused by depredating wildlife to protect America's agricultural, industrial, and natural resources and to safeguard public health and safety regarding the WS program. The NWSAC remains in place for two years from the date of inception.
    - Recently appointed NWSAC members represent various sectors, including but not limited to farming and ranching, wildlife management, animal welfare, academia and other research institutions, tribal entities, state/county/local governments, and natural resources associations/organizations.
    - WS announced the appointed membership via a stakeholder announcement on March 22.
    - WS is hoping to hold the first NWSAC meeting in the fall of 2023 in the DC/Riverdale area.
- National Feral Swine Program (NFSP) Updates:
    - The NFSP works with all 50 states and three territories to control existing and emerging populations of feral swine that threaten agriculture, other property, native ecosystems, and human and animal health. Agriculture continues to comprise the majority (49%) of resources protected, followed by property (28%)
    - The funding the NFSP receives supports local collaboration with states, tribes, other federal agencies, and other organizations. WS eliminated feral swine in seven states (CO, ID, MD, MN, ME, NJ, and NY) and is monitoring to confirm elimination in four additional states (IA, VT, WA, and WI).
    - In states where feral swine elimination has occurred, NFSP continues to provide support, as needed to maintain outreach, and eliminate new incursions.

        - NFSP also conducts targeted surveillance for diseases of highest concern.
- Farm Bill Updates
    - The 2018 Farm Bill provided funding for WS and the Natural Resources Conservation Service (NRCS) to create the Feral Swine Eradication and Control Pilot Program (FSCP), which augmented the NFSP.
        - The FSCP funding was $75 million - equally split between WS and NRCS - over five years.
        - Using this funding, WS implements feral swine management activities in 34 pilot projects in 12 states (AL, AR, FL, GA, LA, MS, NC, SC, HI, MO, OK, and TX).
        - Under the Farm Bill funding, WS provides direct control of feral swine, training and outreach, media responses, disease monitoring, research to develop new management tools, and evaluates effectiveness of operational activities.

Livestock Protection

- General Livestock Protection Activities
    - In FY22, WS provided livestock protection services to ranchers in 50 states and 3 territories to reduce impact of predators on their animals, protecting 9.5 million head of cattle, 5.1 million head of sheep, and 55 million head of other livestock in 340,000 direct control actions. In FY22, WS provided more than 20,800 technical assistance activities that enabled 6,180 livestock producers to implement improved husbandry and methods such as use of guard animals, exclusion, fencing, and predator dispersal.
    - During FY2022, WS employees delivered 19 predator damage management workshops attended by more than 3,000 individuals from 14 states.
    - In FY2022, WS provided technical and direct assistance to over 1,600 entities in 25 states to protect agriculture and other resources from black vulture damage.
    - Through a 5-year agreement with FWS (negotiated in FY2021) WS continues to enhance the operational grizzly bear program in Montana to conserve bears and protect livestock.

Wolf Update

- USDA Wolf Leadership Group
    - USDA convened an internal leadership group in July 2022 to coordinate among the agencies that intersect with wolf conservation. Agencies include APHIS WS, NRCS, FSA, and Forest Service. Currently the group is holding quarterly meetings (already occurred in Oct 2022 and February 2023—planning the Q3 meeting in May 2023).
- WS Operational Work
    - WS conducts integrated wolf damage management in 10 states for wolves:
        - Gray wolves – CA*, CO*, ID, MI*, MN, MT, OR*, WI*, WY
        - Mexican gray wolves – AZ*, NM*
          *denotes exclusively, or almost exclusively, nonlethal activities because these wolves (or most of the wolves in these states) are protected under the ESA
        - Each of these states has received WS Nonlethal Initiative funding for all four years of the initiative so far (FY20, FY21, FY22, FY23)
    - Many WS state programs work cooperatively with state agencies, tribes, or FWS, at the partner agency's request, to help capture and collar wolves for population monitoring.

Nonlethal Initiative

- Congress allocated $4.5M in FY23 for nonlethal beaver damage management (beavers were added for the first time in FY22, currently in second year of funding) and nonlethal livestock protection from large carnivore depredation.
- In FY23, WS programs in 12 states and three units at NWRC are receiving funding.
    - Livestock protection activities include range riding, electric and permanent fencing, fladry installation and maintenance, harassing predators, and other methods which nonlethally reduce depredation from wolves, grizzly and black bears, mountain lions, and other predators.
    - Nonlethal beaver damage management activities are primarily focused on excluding beaver from valued resources, installing water-leveling devices, and relocating beaver to more desirable areas.

Risk Assessments

- USDA APHIS WS has been preparing risk assessments (RAs) on many of the methods it uses, which analyze the impacts of these WDM methods on people and the environment.
- AFWA selects peer reviewers to review. All assessments (including drafts) are available to the public on the APHIS-WS-NEPA webpage.
- WS has completed 19 RAs.
  - Five RAs are currently in the external peer review process.
  - Five more RAs are in progress and should be available for review by October 2023.
  - An additional six RAs have been identified, but not yet initiated.

Please see the attached report in the **Appendix** for more information on the following topics covered in the USDA-APHIS_WS report:

- HPAI
- American Rescue Plan
- CWD
- National Rabies Management Program Update

- **Berryman Institute (Terry Messmer)**

  - See **Appendix** for the report provided

- **Wildlife Management Institute (Chris Smith)**
  - WMI works with the Interagency Grizzly Bear Committee relative to minimizing conflicts with GBs. There is a subcommittee in each GB recovery zone. Funding is being provided to NGO partners to minimize conflicts in areas that may attract bears. The IGBC has a bear resistant testing and approval program that has some 950 products and the list of these products is available on the website: http://igbconline.org/wp-content/uploads/2021/11/211116_Certified_Products_List.pdf
  - a project to test black bear resistant containers continues. One challenge is that penned bears are used to test the containers for resistance and bears must interact with the container for a full hour. Bears learn quickly that they can not gain access to the contents of the containers, so it is a challenge to get them to interact for a full hour.
  - need cross testing for both species and information on black bear resistant containers will be available on the WMI website
  - evaluating hog toxicant delivery systems that will avoid bears
  - under a Mulitstate Conservation Grant WMI is compiled agency regulations regarding feral swine management. This report will be posted on the WMI and AFWA websites soon.

- **Pathways Conference 2023 (Bryant White)**

  - AFWA will host a session on Human/Wildlife Conflicts and Public Perceptions at the 2023 Pathways Conference in Fort Collins, Colorado. The session will occur on Saturday, June 3.

  - The session will include the following presentations:

    Common Raven Management: A tiered approach
    Pat Jackson (Nevada Department of Wildlife), Peter Coates (USGS), Seth Dettenmaier (USGS), Cali Roth (USGS), Shawn O'Neil (USGS)

    Feral Swine Conflicts and Public Perceptions
    John Tomecek (Texas A&M University)

    Trapping in Human Wildlife Conflict Management
    Bryant White (Association of Fish and Wildlife Agencies)

Effectiveness and Producer Perception and Interest of Fladry and Range Riding Employed by USDA Wildlife Services Operations to Protect Livestock from Depredation
Stewart Breck (USDA-APHIS-National Wildlife Research Center), Keith Carlisle (National Wildlife Research Center), Jeff Schultz (USDA-APHIS-National Wildlife Research Center), Julie Young (Utah State University), Eric Gese (USDA-APHIS-National Wildlife Research Center)

Urban Coyote as a Conflict Source: Management options
Brian Wakeling (Montana Fish, Wildlife, and Parks), Paul Curtis (Cornell University), David Bergman (USDA Wildlife Services), Bryant White (Association of Fish and Wildlife Agencies)

Using Fladry to Reduce Carnivore Conflict
Dustin Ranglack (USDA APHIS WS NWRC Utah Field Station)

- **Human Health and Ecological Risk Assessment for the Use of Wildlife Damage Management Methods by APHIS-Wildlife Services (Bryant White)**
  - AFWA began assisting Wildlife Services with these risk assessments in 2019. To date 19 methods have been reviewed by state fish and wildlife agency personnel.
  - An additional 4 methods were submitted for review in 2022 and are near completion.
  - 2 additional methods are being reviewed in 2023; 4-Aminopyridine (Avitrol) and Chlorophacinone. 3 reviews of each method are needed. AFWA is seeking qualified state agency personnel to assist in these reviews. A few volunteered to assist in these reviews including Meredith Longoria (TX PWD), Eric Lobner (WI DNR), Jared Duquette (MI DNR).

- **Potential for development of another human/wildlife conflict monograph. What species/topic next? (beavers)**
  - After some discussion it was agreed that the Working Group will begin the development of a paper on managing conflicts with beaver. The group will begin to develop a list of authors. A timeline and outline will be developed and presented at the next meeting of the Working Group.

- **USGS National Climate Adaptation Science Center: Impacts of Climate Change to WildlifeConflicts (Kate Malpeli)**

  - Since the last working group meeting, the USGS National CASC has continued to make progress on two products related to understanding the effects of climate on human-wildlife conflict.
    - Product 1: "The Effects of Climate on Bear Biology and Behavior, and Implications for Human-Bear Conflict"
      - A team of USGS researchers are systematically synthesizing peer-reviewed studies to identify the direct and indirect mechanisms by which climate variability and change have already and could potentially affect black and brown bears and their interactions with humans in North America. We have reviewed 120 papers for this synthesis and are about 90% through a first draft of the manuscript. We will be submitting this as a review paper to *The Journal of Wildlife Management* in late spring/early summer 2023. Project team members include Kate Malpeli (Biologist, USGS National CASC), Katherine Kurth (Post-doc, USGS National CASC), Heather Johnson (Wildlife Biologist, USGS Alaska Science Center), Frank van Manen (Wildlife Biologist, USGS Northern Rocky Mountain Science Center, lead for the Interagency Grizzly Bear Study Team), and Joe Clark (Wildlife Biologist, USGS Southern Appalachian Field Branch).
  - Product 2: Fact sheet series
    - This is meant to be a series of species-specific fact sheets, where each fact sheet is a mini synthesis on how climate affects that species and the implications for conflict. Our first fact sheet will be focused on feral swine, and we are currently in the process of synthesizing the literature. The next step will be to finalize the format of the fact sheets, with the goal being to create a standard template that could be used to cover other species in the future. Once we have a completed draft of the feral swine fact sheet, we will be reaching out to the working group to

identify members who might be willing to review the fact sheet and help us ensure that the content is useful to the management community. We tentatively plan to do this in late spring/early summer 2023.

- **Roundtable: State/Federal/Tribal/Provincial/Regional Associations/AFWA Members**
  - See appendix for the reports provided: Montana, Wyoming

- **Wrap-up Discussion and Assignments for Next Meeting (B. Wakeling/D. Brimeyer)**
  - Begin development of a monograph on conflicts with beaver
  - Continue to conduct Risk Assessment reviews for partners at Wildlife Services

Appendix:

Berryman Institute Report
Montana Department of Fish, Wildlife and Parks Report
Wyoming Game and Fish Department Report
USDA-APHIS-WS Report on additional topics (so maps could be included)

Report to AFWA Human Wildlife Conflict Working Group

AGENCY: **Berryman Institute, Utah State University**
DATE: March 8, 2023
STATE/PROVINCE/FEDERAL/TRIBAL:

Submitted by: Terry Messmer

Telephone: 435-797-3975 **E-mail: terry.messmer@usu.edu**

---

1. **MOST SIGNIFICANT ISSUES**
   a. **On-Going**

Published Human Wildlife Interaction - special issue Vol 15 Issue on raven ecology and their management https://digitalcommons.usu.edu/hwi/
This issues contains 22 peer-reviewed papers on raven ecology, impacts, and management

HWI Vol 16 – Issue 1 (Spring 2023); 2 Wild Horses and Burros (Summer 2023); and 3 (Fall 2023). Vol 17 Issue 1 Island Invaders (Winter 2024)

Impact Factor - 2.119

Cougar Management in North America - The updated book is at the printers for final layout and design - Printing is scheduled for this summer (1000 copies)

Feral Cat monograph - This monograph is at the printers – proof expected the end of March with printing in April 2023 (1000 copies)

   b. **Emerging**

20th Wildlife Damage Management Conference – Logan Utah April 16-20, 2023
https://berrymaninstitute.org/2022WDM

.

2. **CONFLICT INCIDENT REPORT BY SPECIES**

3. **SIGNIFICANT REGULATORY OR POLICY CHANGES OR ISSUES?**

None

4. **RESEARCH /SPECIAL PROJECTS**

Free-roaming Equids - The Free Roaming Equids and Ecosystem Sustainability Network (FREES) is a group of diverse organizations working for a common goal of "healthy herds of free-roaming equids (wild horse and burros) on healthy rangelands." FREES seeks to enhance communication and engage diverse stakeholder groups in meaningful dialogue as they work to achieve equid and ecosystem sustainability.

The Free Roaming Equid and Ecosystem Sustainability network will host two free public webinars with the first one starting on ***April 5, 2023*** *and the second* ***April 25th*** to demonstrate *PopEquus* and answer questions about the model. The webinars will feature scientists from the USGS and BLM who helped develop the tool.

https://extension.usu.edu/freesnetwork/webinars/index

Title: PopEquus-A tool for modeling wild horse population response to management

The US Geological Survey (USGS) released a new wild horse modeling program to the public. The Free Roaming Equid and Ecosystem Sustainability network will host two 90-minute free public webinars starting on **April 5, 2023**, and the second **April 25th, 2023** to demonstrate *PopEquus* and answer questions about the model. Both webinars will begin at **10:00 AM, MST**. The webinars will feature scientists from the **USGS and Bureau of Land Management (BLM)** who helped develop the tool.
The model can be accessed at: **https://rconnect.usgs.gov/popequus/**

5. **OTHER**

Report to AFWA Human Wildlife Conflict Working Group

AGENCY: Montana Fish, Wildlife and Parks **DATE: March 15, 2023**
STATE/PROVINCE/FEDERAL/TRIBAL:

Submitted by
Brian Wakeling

Telephone: 406-444-3940 **E-mail: brian.wakeling@mt.gov**

---

1. MOST SIGNIFICANT ISSUES

a. On-Going

Montana game wardens precisely record activities that involve urban wildlife, but biologists do not similarly record these activities. Reports of actions tend to underrepresent the frequency of occurrences. Most urban wildlife activities are focused on reducing conflicts with large mammals. Lack of a consistent reporting mechanism limits Montana's ability to report on prevalence of these issues.

b. Emerging

Montana was sued regarding the adequacy of our existing wolf management plan, adopted in 2003, and a temporary restraining order was issued prior to the beginning of our 2022 fall trapping season that limited methods of take and bag limits that had been authorized by legislation in 2021 and Commission action in 2022. The temporary restraining order was lifted following a hearing, although the wolf plan was questioned by the judge. Subsequently, the governor directed the department to begin a revision of the wolf plan; the objective is to get the plan revised within a year.

Montana is also updating the grizzly bear management plan. This plan has been under revision for the past 3 years, although focus on adoption has increased since Montana, Wyoming, and Idaho have petitioned the USFWS for delisting grizzly bears in portions of their range.

While we are updating plans, the elk management plan (last updated in 2005) is also being revised and updated. Final approval of this plan is anticipated in August-September 2023.

2. CONFLICT INCIDENT REPORT BY SPECIES

In 2022, Montana Game Wardens spent 595 days (4,758.1 human resource days or 2.3 years) responding to urban or game damage complaints regarding wildlife. Of that time, almost 75% was spent on urban wildlife calls. Game damage comprised another 14% of the time, while specific responses to bears, lions, deer, elk, and composed another 9.4% of the total.

3. SIGNIFICANT REGULATORY OR POLICY CHANGES OR ISSUES?

The legislative session is about halfway to completion. Several department sponsored bills have moved through at least one chamber and some have reached the finish line. Wildlife-related bills moving through include bills to lift the sunset on the Wildlife Habitat Improvement Program (HB86), remove the pheasant stocking requirement of the Upland Game Bird Enhancement Program (HB74), and a bill to allow non-enforcement staff to use firearms (HB42). Bills to reinforce the commitment to grizzly bear recovery and management and demonstrate adequate regulatory mechanisms have moved (SB85, SB295) and bills that would have mandated where wolf trapping and snaring and black bear hound hunting must occur were tabled (HBs 627, 628, 630). A bill to limit conservation easements to not more than 40 years (SB357) was also tabled.

4. RESEARCH /SPECIAL PROJECTS

No research or special projects specific to wildlife conflict.

5. OTHER

Montana is working with neighboring states and provinces through the WAFWA Forest Carnivore Subcommittee to develop and maintain monitoring for wolverine, lynx, swift fox, and fisher (among others).

See the May-June 2022 and Jan-Feb issues of The Wildlife Professional for a couple of articles that address public management of predators. Specifically, Chris Serheen wrote an article critical of politics surrounding predator management primarily in Montana and Idaho (entitled "Anti-predator and anti-science: politically driven carnivore management in Idaho and Montana should worry wildlife professionals") and Brian Wakeling penned a different perspective (entitled "Policy, predators, and the public trust: biology and politics both play important roles in wildlife management"). CRC Press is publishing Ecology and Management of Black-tailed and Mule Deer of North America, which will include a chapter on Conflict that relied on products and authors from HWCWG members.

Report to AFWA Human Wildlife Conflict Working Group

AGENCY: Wyoming Game and Fish Department **DATE:**
STATE/PROVINCE/FEDERAL/TRIBAL:

Submitted by
(Doug Brimeyer)

Telephone: **E-mail:**

---

1. **MOST SIGNIFICANT ISSUES**
   a. **On-Going**

In Wyoming grizzly bears continued to expand into more residential and agricultural settings and areas that are inherently more prone to conflict. The public remains concerned about federal oversight, ESA protections and the ongoing litigation with regard to grizzly bears. Over the last few years public recreation and the use of private lands has increased. The Wyoming Game and Fish Department continues to reach out to raise awareness and educate the public throughout Wyoming. There is increasing scrutiny on management of large carnivores from multiple viewpoints. West-wide decreasing mule deer populations has increased interest in management of all predacious species. Successful litigation to hamper wildlife management and ESA related issues has resulted in more lawsuits and a burden on managers time as they deal with data requests specific to litigation.

   b. **Emerging**

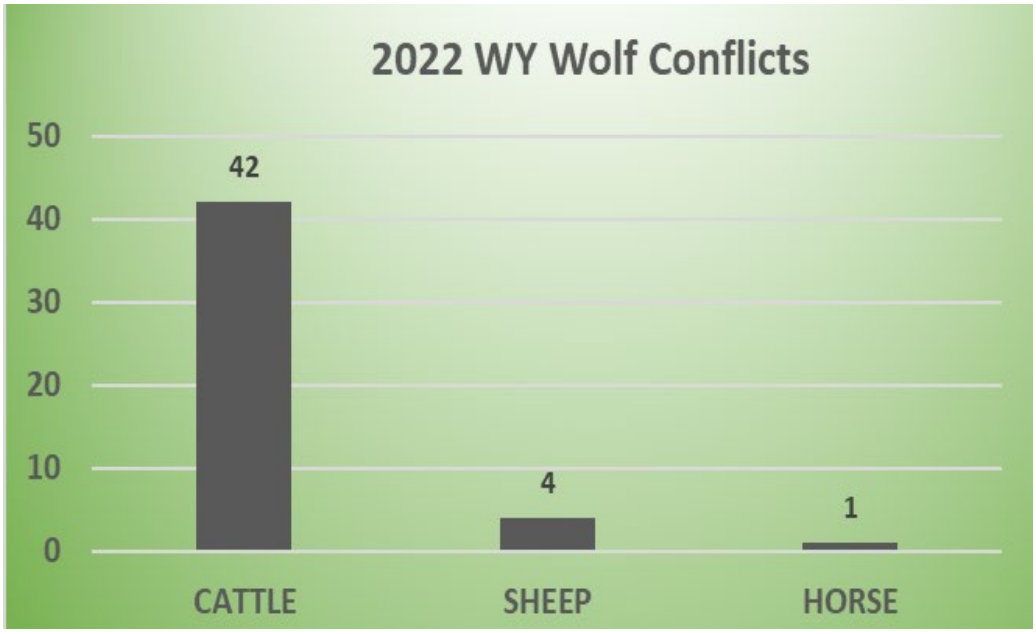
As stated in on-going, increasing human use and increasing abundance/distribution of certain carnivore species is continuous, but is also considered emergent in certain areas of the state. There was immense public interest and scrutiny on a few "celebrity" grizzly bears that requires a great deal of our personnel's time and this continues – differing mind-sets and management philosophies in agency management approaches confuse the public and require more consistency and collaboration among agencies.

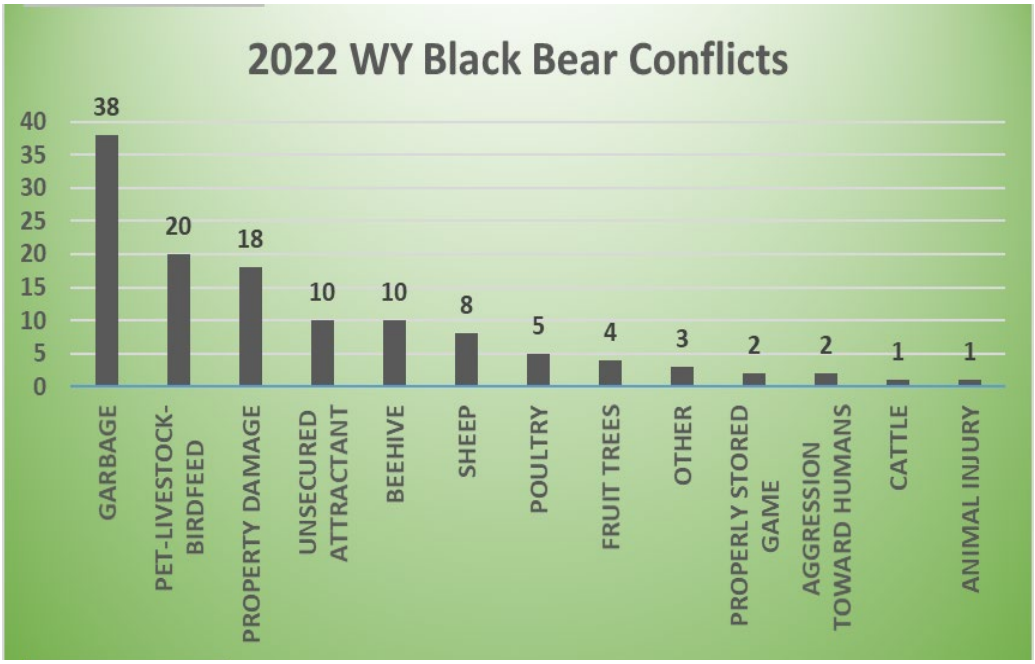
2. **CONFLICT INCIDENT REPORT BY SPECIES**

The following figures all represent data obtained by the Wyoming Game and Fish and assorted parties and numbers are from **verified conflicts.**

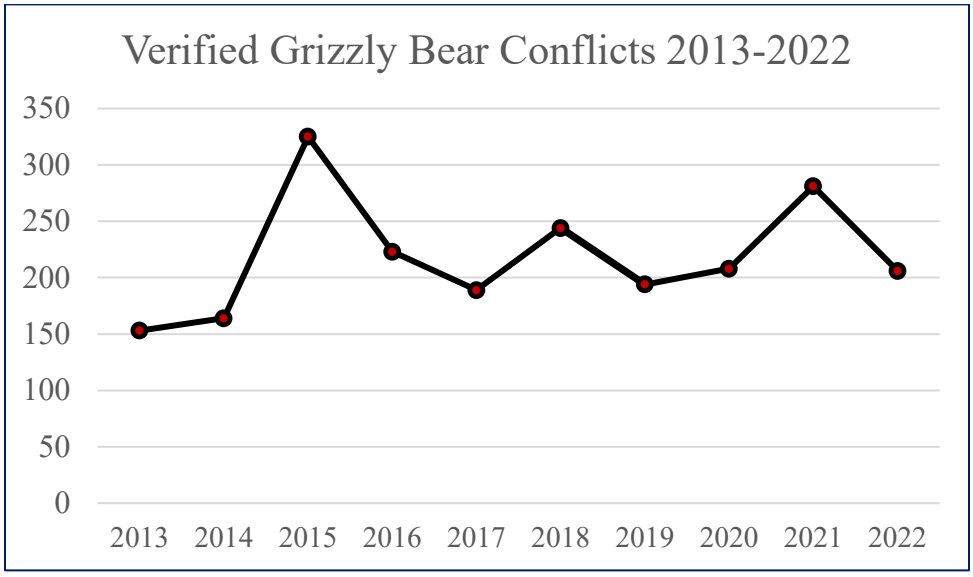

2022 WY Large Carnivore Conflicts
250
200
150
100
50
0
206
122
47
32
GRIZZLY BEAR
BLACK BEAR
WOLF
MOUNTAIN LION

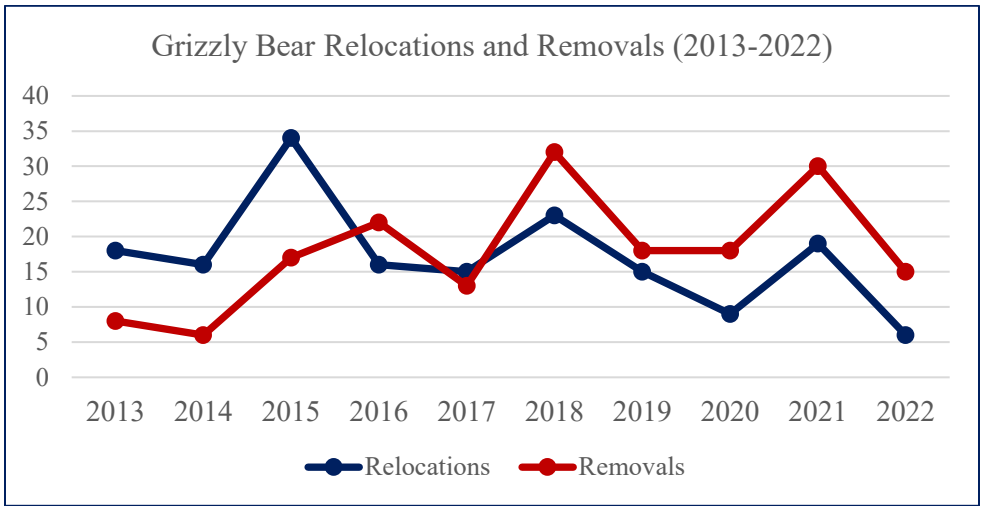

2022 WY Mountain Lion Conflicts
20
15
10
5
0
18
5
4
3
1
1
SHEEP
PET/GUARD ANIMAL
OTHER
ANIMAL DEATH
AGGRESSION TOWARD HUMANS
POULTRY
CONFLICT TYPE


2022 WY Wolf Conflicts
50
40
30
20
10
0
42
4
1
CATTLE
SHEEP
HORSE


2022 WY Black Bear Conflicts
40
35
30
25
20
15
10
5
0
38
20
18
10
10
8
5
4
3
2
2
1
1
GARBAGE
PET-LIVESTOCK-BIRDFEED
PROPERTY DAMAGE
UNSECURED ATTRACTANT
BEEHIVE
SHEEP
POULTRY
FRUIT TREES
OTHER
PROPERLY STORED GAME
AGGRESSION TOWARD HUMANS
CATTLE
ANIMAL INJURY


2022 WY Grizzly Bear Conflicts
140
120
100
80
60
40
20
0
128
15
12
11
10
8
6
4
3
2
2
1
1
1
1
1
CATTLE
OTHER
GARBAGE
AGGRESSION TOWARD HUMANS
PET-LIVESTOCK-BIRDFEED
SHEEP
ANIMAL DEATH
PROPERTY DAMAGE
POULTRY
BEEHIVE
HUMAN INJURY
FRUIT TREES
ANIMAL INJURY
UNSECURED ATTRACTANT
PROPERLY STORED GAME
PET/GUARD ANIMAL


Verified Grizzly Bear Conflicts 2013-2022
350
300
250
200
150
100
50
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022



3. SIGNIFICANT REGULATORY OR POLICY CHANGES OR ISSUES?

In December of 2021 the Wyoming Game and Fish Department updated the "Tri-State Memorandum of Agreement" that directs future management of discretionary mortality by the three states in a collaborative fashion for a delisted grizzly bear population. Subsequent to all three states updated the MOA, the Governor of Wyoming submitted a petition to establish the Greater Yellowstone Ecosystem (GYE) grizzly bear distinct population segment (DPS) and remove the GYE DPS from the federal list of endangered and threatened wildlife – the MOA and petition address the issues brought forth by the 9th Circuit District Court ruling that relisted GYE grizzly bears. The population is fully recovered based on all recovery criteria, yet due to previous litigation and court decisions grizzly bears are still classified as threatened. This classification impacts management but also brings into play multiple additional jurisdictional involvement regarding land use practices in areas with grizzly bears (biological opinions on grazing, development etc.) In February of 2022 the U.S. Fish and Wildlife Service provided their 90 day finding (which took over 12 months) that the petition from the State of Wyoming warrants merit and will proceed with the Status Review to determine if they will proceed with a subsequent delisting rule. As part of the Intergency Grizzly Bear Study Team, Wyoming Game and Fish personnel have been pivotal in transitioning and updating population demographics and modelling techniques with the plan of shifting toward an Integrated Population Model (IPM) approach for GYE grizzly bears.

4. RESEARCH /SPECIAL PROJECTS

We are currently finalizing the research project with University of California/Berkeley evaluating cause specific mortality of bovine calves in an area with an intact large carnivore guild and known depredation by wolves and grizzly bears on domestic cattle. We have engaged with USDA Wildlife Services on multiple permanent fencing structures and nonlethal measures

to mitigate conflict between large carnivores and people and continue to evaluate our current data and procedures to increase our efficacy in dealing with conflicts and overall conflict management. We have initiated an in-depth research project with the University of Wyoming to evaluate the interactions between and apex predator (mountain lions) and chronic wasting disease (CWD) of mule deer in an area with high prevalence of the disease. We are evaluating what role predation may play in CWD prevalence and larger population level impact on mule deer populations and we are also involved in capturing mountain lions in association with known migration corridors of ungulates.

5. OTHER

USDA/APHIS Wildlife Services
Update for the 88th North American Wildlife and Natural Resources Conference
March 2023

SARS-CoV-2 SURVEILLANCE: American Rescue Plan (ARP) -APHIS

APHIS is the lead USDA agency assigned to significantly increase and enhance the animal health community's capability to prevent, detect, investigate, and respond to emerging and zoonotic diseases, including SARS CoV-2, in susceptible animal species. The multi-year effort ($300M) will focus on expanding SARS-CoV-2 surveillance to a wide range of animal species, increasing diagnostic testing capability and capacity, and investigating new animal detections and exposures and to build an early warning system that will help protect both people and animals from future disease threats. After public and stakeholder input, APHIS finalized APHIS' American Rescue Plan Surveillance Program: Strategic Framework in February 2022. APHIS launched a new One Health website to provide valuable data on testing, surveillance, and guidance, based on the outcomes of APHIS' ARP work.

WS SARS-CoV-2 in Cervids

WS works in a One Health capacity to integrate expertise from specialists in human health, agricultural animal health, wildlife, and environmental studies. In 2021, APHIS WS monitoring found that approximately 40% of white-tailed deer (WTD) serum samples collected in 4 states (MI, IL, PA, NY) contained SARS-CoV-2 antibodies. Building upon this and findings that WTD can be infected with SARS-CoV-2 and transmit the virus to other deer, APHIS WS and its partners are conducting a phased, multi-year approach to understand the impacts of SARS-CoV-2 in WTD to animal and human health. The goals of the project are to determine how widespread the virus is in U.S. WTD populations and if WTD can serve as a reservoir for the virus, potentially leading to new virus variants that may impact the health of WTD, other animals, and people; and to better understand the scale and scope of SARS-CoV-2 exposure and current dynamics in regional and local WTD populations. Later phases will focus on more targeted sampling based on information and findings from Year 1.

Year 1 WTD (Nov. 2021 through Sep. 2022; actual cost $1.6M, some as cooperative agreements to States)

WS partnered with 28 states and the District of Columbia to opportunistically collect samples from hunter harvested WTD. WS supplemented opportunistic sampling with operational and state agency harvest activities. Samples collected included blood on Nobuto filter paper strips for antibody testing and nasal or oral swabs for PCR and genetic sequencing. Of 10,790 blood samples from 28 States and D.C., an apparent seroprevalence of 31.5% was found with positives in 27 States and D.C. PCR testing of 11,395 swabs collected from 27 States and the D.C. showed an apparent prevalence of 12.3% with positives in 25 States and D.C.

Year 2 WTD (Oct. 2022 through Sep. 2023, est. cost $7.4M, some as cooperative agreements to States)

WS partnerships increased to 35 states and territories and 5 Tribal Wildlife Agencies. As of 3/14/2023, 15,785 swab samples and 15,636 blood samples have been collected from 32 States and territories and 5 Tribal Wildlife Agencies. Approximately 30% of swabs and 5% of blood samples have been tested so far, with positives in ten states and eight states, respectively.

Expansion of ARP SARS-CoV-2 Surveillance to Mule Deer and Other Cervids (MDO) (Oct. 2022 through Sep. 2023, est. cost $4.9M, some as cooperative agreements to states)

WS has partnered with 20 states and territories for this project. Two of the five Tribal Wildlife Agencies participating in WTD surveillance are also participating in the MDO project. As of 3/14/23, 1,648 swab samples and 1,426 blood samples have been collected from 20 States and territories and 1 Tribal Wildlife Agency. Approximately 43% of swab samples have been tested to date, with positives from mule deer in two states. No positive detections have been found in blood samples, although less than 5% of samples collected have been tested to date.

ARP Cooperative Agreements

WS provides State Wildlife Agencies funds to collect WTD or MDO samples. There are currently cooperative agreements for WTD in ten states (CO, KS, MA, MN, MO, MS, TN, VT, WI, WV), with a pending agreement in WA. Four states (CO, KS, NV, UT) have MDO cooperative agreements, with agreements pending in AK and WA. Tribal participation includes 3 WTD and 2 WTD and MDO participants. WS, in partnership with VS and CDC, also has an agreement with the University of Missouri for evolutionary analyses—an in-depth genomic analyses of sequences in deer and humans to help understand the movement of virus between them.

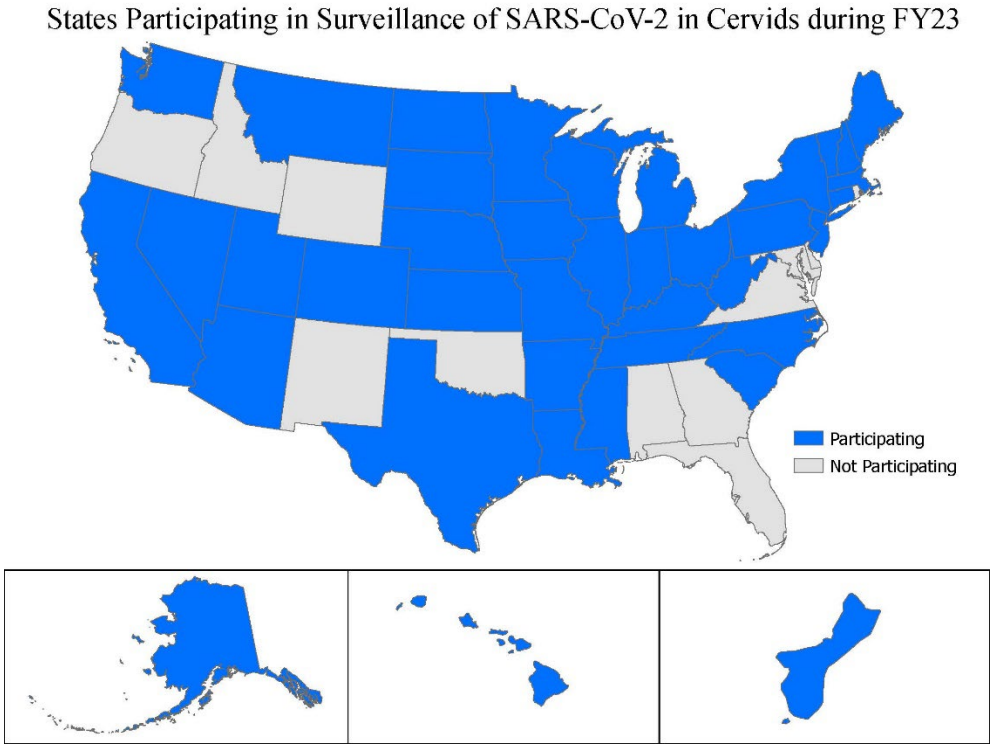


Figure 1. States and territories participating in surveillance of SARS-CoV-2 in cervids during FY23

Other ARP Projects and Activities

Receptor Affinity - This project aims to characterize host receptor and protease interactions with ligands and cofactors to identify susceptible species and which species should be prioritized for future monitoring and surveillance efforts.

Experimental Infections - The goals of this activity are to identify priority wildlife species that are susceptible to the virus, understand if wildlife species that do replicate the virus have the capacity to shed virus in quantities sufficient to infect other animals, to assess wildlife susceptibility to new variants, and to evaluate potential emergence of novel virus variants.

Wildlife Human Interactions – To better understand potential interactions between humans and deer, this project will leverage extant passive sampling data (camera traps), animal movement data, and human mobility data to quantify the rates of co-occurrence between deer and humans at specific locations across multiple US cities.

Wild Carnivores – Determine how widespread the virus is in carnivore populations in the United States and if they can serve as a reservoir for the virus, potentially leading to new virus variants that may impact the health of carnivores, other animals, and people.

ARS WTD Experimental Infections – WS in collaboration with VS and ARS will conduct experimental infections of SARS-CoV-2 in white-tailed deer to address priority information needs to characterize infection and immune dynamics.

Serosurvey - The goal of this 2-year activity is to determine the extent wildlife species within the US have been exposed to the virus. Initially, data on SARS-CoV-2 exposure rates will be based on archived sera samples to identify candidate species for a field monitoring serosurvey.

MinkSTAMP - The goals of this project are to encourage biosecurity, develop educational resources for workers and owners, facilitate on-site and lab testing of mink, humans, and wildlife, and to support affected producers and State animal health officials in the event of an outbreak.

Zoo - The goals of this project are to establish standard practices for physical biosecurity and personnel management for zoos and aquaria that prevent exposure of animals to SARS-CoV-2, and to help zoos and aquaria to prevent exposure of their collection to future disease challenges. Additionally, peridomestic animals on and around zoo facilities will be tested for evidence of SARS-CoV-2 infection, identifying possible routes of transmission.

Wastewater - In this project, we propose to examine whether WWTP are a source of SARS-CoV-2 that spills over into a variety of peridomestic wildlife species that have the potential to spillback to human populations.

SARS-CoV-2 coordination: Contact Thomas.j.deliberto@usda.gov

CHRONIC WASTING DISEASE (CWD):

CWD Surveillance and Operational Activities

Wildlife Services has been working with VS Veterinary Services (VS) and/or state programs to collect Chronic Wasting Disease (CWD) samples from captive cervids. To reduce the prevalence, prevent the spread, and define the scope of CWD in certain areas, WS cervid sampling incorporates a diverse array of techniques and works with multiple cooperators, including state wildlife agencies, state and national diagnostic laboratories, and other local governments. Upon request, WS assists numerous state game programs with CWD sampling at hunter harvest deer check stations and other locations. The NWDP deploys wildlife disease biologist to help states with target deer removals and necropsies for CWD surveillance in infected areas. WS also assists state programs with the development and implementation of CWD contingency plans in states that are currently free of the disease.

FY22 CWD Cooperative Agreements

APHIS hosted its third annual CWD stakeholder and Tribal Nations meeting in January 2023. Three guest speakers presented their research, and the DOI and USDA agencies gave an overview of CWD initiatives nationally. Following, 2022 cooperative agreement recipients presented updates on funded wild and farmed cervid management and research projects. Stakeholder and tribal nations gave feedback; and a presentation and discussion about the process for cooperative agreements in 2023 was given. At the end of the meeting, a poll was distributed which asked about the attendees' affiliation; important priorities to their organization related to wild and farmed cervids; and proposed changes to the priorities.

Approximately 300 participants attended with individuals invited from state wildlife and department of natural resources (DNR), state agriculture, state cervid industry, Tribal Nations, academic institutions, conservation and sportsmen, national cervid industry, Association of Fish and Wildlife Agencies, National Association of State Animal Health Officials and other federal participants. Other federal participants included representatives from Bureau of Land Management, Bureau of Indian Affairs, Centers for Disease and Prevention and Control, Department of Interior (DOI), and U.S. Department of Agriculture (USDA).

In October 2022, APHIS announced the funding of 49 awards, totaling nearly $10 million for States and Tribal governments, to further develop and implement Chronic Wasting Disease (CWD) management, response, and research activities in both wild and farmed cervids (e.g., deer, elk). These funding opportunities allow State departments of agriculture, State animal health agencies, State departments of wildlife or natural resources, and Federally recognized Native American Tribal governments and Native American Tribal organizations to further develop and implement cervid CWD management, response, and research activities, including surveillance and testing. APHIS received a total of 64 proposals from applicants in 29 States and ten Federally recognized Tribal governments and organizations. Priority was given to States and Tribal governments that have detected CWD and have a CWD monitoring and surveillance program or that proposed to create a control program.

FY22 Award Funding Breakdown:

Wild Cervid CWD Management and Response 2022

- Twenty-nine awards totaling around $4,074,788 million are funding 21 State departments of wildlife to combat CWD in wild cervids.

Tribal Nations Wild Cervid CWD Opportunity 2022

- Five awards totaling $274,973 are funding five Federally recognized Native American Tribal governments to combat CWD in wild cervids.

Farmed Cervids CWD Management and Research Activities 2022

- Fifteen awards will go to 11 State Departments of Agriculture totaling $2,325,492 and two awards will go to a State Department of Natural Resources and State Department of Wildlife for $249,990 and $97,608 respectively, to conduct management and research activities to combat CWD in farmed cervids. Three of these proposals were partially funded. Three State agricultural agencies were also awarded $2,126,910 in funding to specifically support CWD disease response strategies, including the removal of CWD positive herds and CWD exposed animals.

FY23 CWD Cooperative Agreements:

APHIS will make available the following funding opportunities in 2023 (anticipated VS and WS joint announcement in April 2023):

- $6.1 million to State departments of agriculture; State animal health agencies; State departments of wildlife or natural resources; Federally recognized Native American Tribal governments and Native American Tribal organizations or universities representing Federally recognized Native American Tribal governments; and research institutions and universities for projects to control or prevent CWD in farmed cervids, including the use of funds for the indemnification and removal of CWD-affected farmed cervid herds and CWD-exposed cervids as part of an overall CWD management plan; and,
- $5.6 million to State departments of agriculture; State animal health agencies; State departments of wildlife or natural resources; Federally recognized Native American Tribal governments and Native American Tribal organizations or universities representing Federally recognized Native American Tribal governments; and research institutions and universities for projects to control or prevent CWD in wild cervids.

APHIS WS is also developing a separate funding opportunity for Tribal governments' activities to control or prevent CWD in wild cervid populations on Tribal lands:

- $500,000 to federally recognized Native American Tribal governments for projects to control or prevent CWD in wild cervids.

AVIAN INFLUENZA SURVEILLANCE:

Wildlife Services (WS), along with State and Federal partners, continue to conduct annual surveillance for avian influenza viruses (AIVs) in wild waterfowl. Understanding what AIVs are circulating in wild waterfowl informs State, Federal, and industry partners of the presence of any AIVS that are of concern to wildlife and poultry, and to determine the origin of AIVs in the event of an outbreak.

The current AIV surveillance season (May 2022 – April 2023) targeted 112 priority watersheds across 49 states in all four flyways: Atlantic, Central, Mississippi, and Pacific. Sampling focused on dabbling duck species, and priority watersheds were selected based on areas that have high mixing of wild waterfowl populations and previous evidence of influenza infections in those populations. During the 2022

calendar year, WS collected 33,527 samples across all flyways. Of those, 33,361 samples were tested at the National Animal Health Laboratory Network diagnostic facilities. All non-negative AIV samples were shipped to the APHIS National Veterinary Services Laboratories for confirmation.

In January 2022, the highly pathogenic EA/AM H5N1 strain was detected in two hunter harvested wild ducks (American wigeon, blue-winged teal) in Colleton County, South Carolina. WS responded by expanding the 2021 -2022 (May 2021 – April 2022) surveillance to include opportunistic sampling in the Central and Mississippi flyways, resulting in over 1600 samples collected within four Central Flyway states (KS, ND, TX, WY) and eight Mississippi Flyway states (AL, AR, IN, KY, LA, MO, MS, TN).

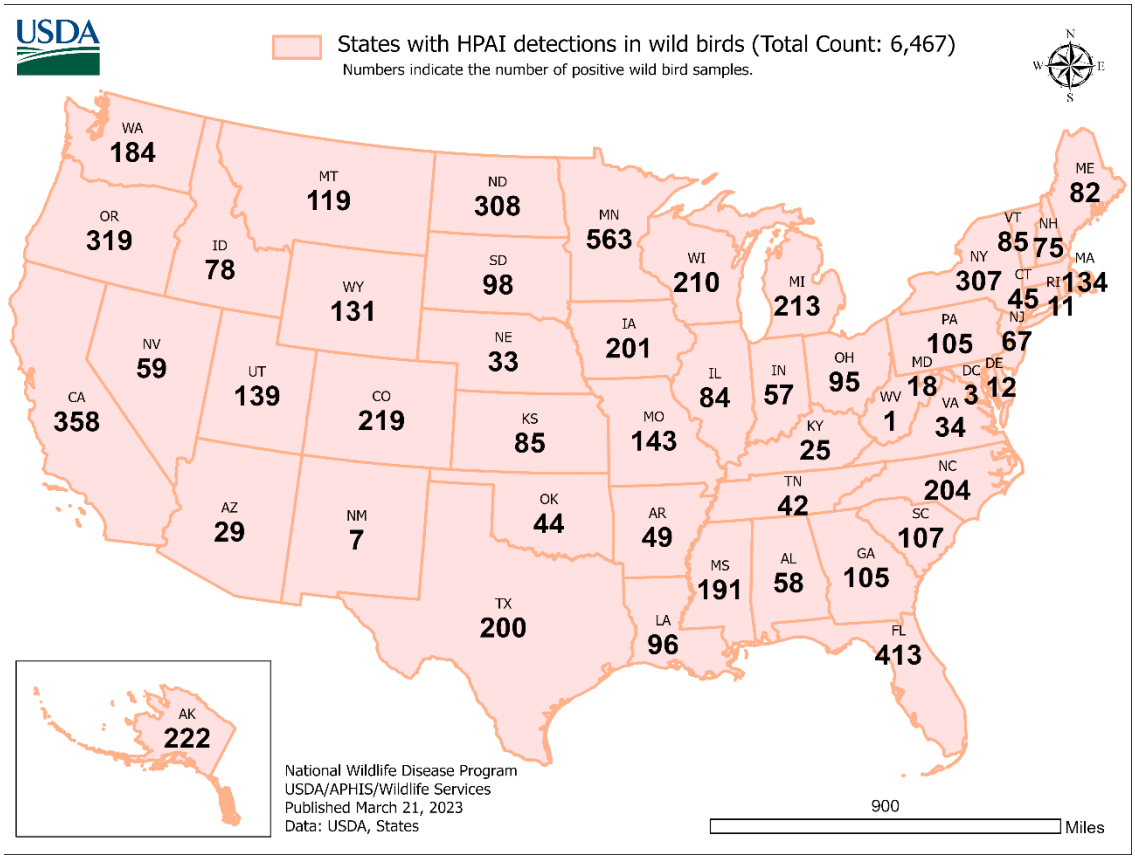
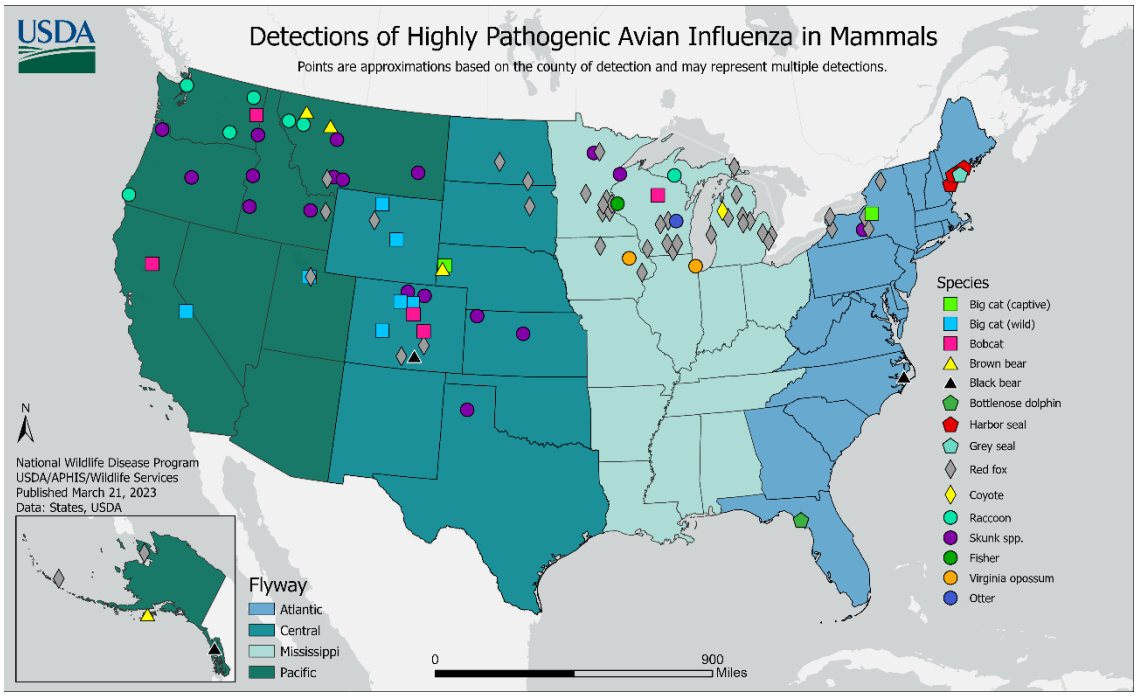
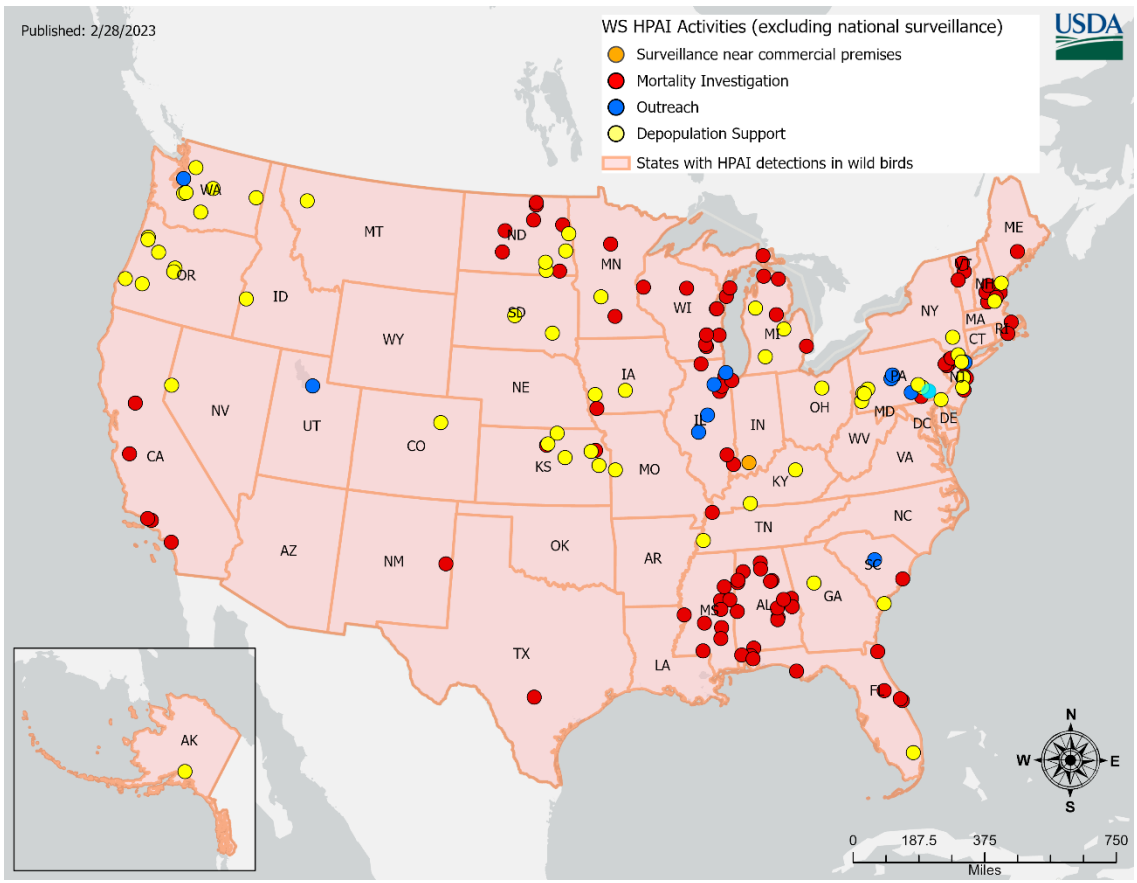


Figure 2. Number of highly pathogenic strain H5N1 detections in wild birds since January 2022. Count includes samples collected by Wildlife Services and other agencies and organizations.

Of the samples collected by WS since January 2022, over 2,800 have tested positive for H5N1. These detections primarily were made in mallard, American green-winged teal, blue-winged teal, and American wigeon species. WS also tracks morbidity and mortality investigations alongside other agencies and organizations. Nearly 3,600 HPAI detections have been reported by other agencies in a more diverse collection of wild bird species that include, but are not limited to, geese, raptors, owls, pelicans, vultures, songbirds, shorebirds, cranes, and ducks. At least 145 species of wild birds have been affected in this outbreak in 49 states and Washington D.C. (Figure 1).

The geographic distribution of migratory birds introduces the potential for spillover from H5N1 infected birds to mammals, where it can cause high mortality. Many mammalian infections have occurred in





Figures 3-4. (Top to bottom) Number of highly pathogenic strain H5N1 detections in mammals since May 2022; Wildlife Services highly pathogenic avian influenza activities throughout the United States. Does not include national surveillance activities.

carnivores, likely due to predatory habits of feeding on infected animals. The first mammalian detection in the U.S. occurred in May 2022, and to date, there have been 154 H5N1 detections in at least 17 species in 23 states (Figure 2). WS does not conduct national surveillance for mammal species, and most samples are taken from symptomatic animals opportunistically by partner agencies and rehabilitation facilities.

Shortly following the detection of EA/AM H5N1 in wild birds, the first detection occurred in a commercial poultry facility in Indiana. Since then, H5N1 has been detected in commercial poultry facilities in 47 states and has impacted the $38 billion poultry industry through associated eradication costs. WS personnel have been critical in eradication efforts at positive premises around the country (Figure 3) often acting as Case Managers, Site Managers, and Incident Commanders. Since February 9, 2022, WS has deployed personnel to positive commercial premises for a total of 124 physical (2301 combined days) and 16 virtual (1196 combined days) deployments.

WS collects and verifies AIV and HPAI data from multiple sources and reports for the following resource pages:

1. Wild bird targeted surveillance: Wild Bird Avian Influenza Surveillance
    a. Includes only WS avian influenza surveillance data.
2. HPAI in wild birds: 2022 HPAI detections in Wild Birds
    a. Reports all H5 or H5N1 detections following NVSL confirmation testing and mandatory reporting to the World Organisation for Animal Health (WOAH).
3. HPAI in mammals: 2022 HPAI Detections in Mammals
    a. Reports all H5 or H5N1 detections following NVSL confirmation testing and mandatory reporting to WOAH.

RABBIT HEMORRHAGIC DISEASE:

In March 2020, an outbreak of rabbit hemorrhagic disease virus type 2 (RHDV2), an extremely fatal viral disease, hit the southwestern U.S. and spread rapidly, causing mortalities in domestic and wild lagomorph species. The disease has been declared endemic in wildlife in AZ, CA, CO, ID, MT, NV, NM, OR, TX, UT, and WY. Since the onset of the outbreak, the NWDP has worked closely with VS and diagnostic laboratories to track all wild lagomorph samples submitted for testing in both endemic and non-endemic states. Throughout FY22 and FY23, the NWDP has remained in communication with the USGS National Wildlife Research Center, the Southeastern Cooperative Wildlife Disease Study, and State agencies to receive RHDV2 testing results. Sample submission and testing are ongoing, and the NWDP continues to track samples and deliver weekly reports back to the states and VS and provide crucial data utilized in WOAH reporting, disease mapping, and genetic sequencing.

During 2022, there were 54 RHDV2 detections in nine states (AZ, CA, CO, ID, NM, NV, OR, TX, UT) in at least six wild lagomorph species. Since the beginning of the outbreak, over 600 wild lagomorph samples from 41 states have been submitted for testing, and of those, 239 have tested positive for RHDV2. Throughout the outbreak RHDV2 has been detected in eight different species within the Leporidae family (Antelope jackrabbit, Black-tailed jackrabbit, California brush rabbit, Riparian brush rabbit, Desert cottontail, Eastern cottontail, Mountain cottontail, and Pygmy rabbit).

Investigations of wild and domestic lagomorph mortalities continue in states throughout the U.S. A source introduction still has not been definitively identified at this time. Little is known about how RHDV2 is maintained on the landscape, but research has shown the virus can survive in a carcass for as long as 90 days under certain conditions. Prevention of viral transmission in wild species remains unfeasible, and containment and proper disposal of dead animals is crucial upon discovery. General signs for many lagomorphs can include lethargy, paddling, and sudden death; however, oftentimes no symptoms are observed, and animals are simply found dead.

While the virus has been shown to be lethal to some native, wild lagomorph species, much regarding the epidemiology of this virus is unknown. Scientists at the National Wildlife Research Center (NWRC), in collaboration with Colorado State University, are continuing to assess the susceptibility of RHDV2 and mortality rates to select North American lagomorph species and investigating the efficacy of existing and new vaccines in protecting select lagomorphs against the virus.

PLAGUE AND TULAREMIA SURVEILLANCE:

Plague is caused by a bacterial pathogen (*Yersinia pestis*) that can infect a wide range of mammal species. While attention is often focused on human plague infections, it is primarily a wildlife pathogen and the extent of plague exposure in animals is often underappreciated. The WS National Wildlife Disease Program (NWDP) has been collecting data on plague exposure in multiple wildlife species across the western US for more than 15 years, with over 52,000 animals tested. These efforts have contributed to national-level maps that show plague activity in the US and have contributed to our understanding of risks to threatened and endangered species (including black-footed ferrets and others). These data have also been used to look at shifts in plague distribution over time due to changing climates. Pathogen monitoring systems in wildlife that are both large-scale and long-term are rare but offer a clearer picture of zoonotic pathogens and the risks they pose.

Since January 1, 2022, a total of 1,127 animals were sampled by WS for plague and tularemia monitoring across 16 states (AK, AZ, CA, FL, IL, KS, MA, MT, NC, NM, NY, OR, PA, RI, TX, WA). Tularemia diagnostics are currently under development and all samples collected for tularemia are archived by the NWDP. There are currently over 80,000 samples from a variety of mammalian species in the plague and tularemia archive at the NWRC. All samples appropriate for plague diagnostic testing that were received prior to 2022 have been submitted to the lab for testing, with 1,860 samples submitted so far this year. Since FY21, a total of 5,518 samples (includes samples stored in the NWDP archive) have been tested, of which 997 (18.1%) are positive for plague antibodies.

EMERGENCY RESPONSE:

Wildlife Services supports the AHPIS' response efforts for animal diseases, natural disasters, hazardous spills, and wildfires. In FY 2022, personnel supported response efforts involving foreign animal diseases, natural disasters, hazardous spills, and zoonotic diseases. The program collaborated and coordinated with APHIS Veterinary Services and State Animal Health Officials to address the response to HPAI by deploying personnel to assist with domestic and backyard poultry detections. WS assisted with

coordinating, organizing, and communicating natural disaster response and recovery with hurricanes Fiona and Ian. WS assisted with enhanced feral swine removal operations in the Caribbean in response to the African Swine Fever (ASF) detection on the island of Hispaniola. Additionally, WS responded to a request from the state of Michigan and the Environmental Protection Agency to provide wildlife assessments for a hazardous contaminants spill. In total, WS deployed 269 personnel (5569 combined days) either on site or virtually across three mobilized responses.

Wildlife Services National Wildlife Disease Program:
https://www.aphis.usda.gov/aphis/ourfocus/wildlifedamage/programs/nwdp

Contact: Julianna.b.lenoch@usda.gov

National Rabies Management Program

US National Plan for Wildlife Rabies Management

USDA, APHIS, Wildlife Services' National Rabies Management Program (WS NRMP) goals and objectives are based on the WS Strategic Plan, the North American Rabies Management Plan (NARMP), the US National Plan (USNP) for Wildlife Rabies Management and Rabies Program Environmental Assessments. The NRMP initiated an update to the USNP in FY21. The NRMP hosted a virtual Rabies Management Team (Cooperators) Meeting during FY21 involving >125 representatives from >50 agencies that included a series of team breakout exercises designed to inform the update to the USNP. In FY22, the NRMP and a team of approximately 20 collaborators updated the USNP based on the findings and recommendations from the FY21 Cooperators Meeting through a series of six virtual meetings. The NRMP will finalize and distribute the final USNP in April 2023.

Oral Rabies Vaccination (ORV)

In FY22, the NRMP and cooperators distributed >9.1 million ORV baits in 15 states: >8 million in the eastern US to combat raccoon rabies in AL, GA, MA, MD, ME, NH, NY, NC, OH, PA, TN, VT, VA, and WV; and >1.1 million in Texas to prevent the reemergence of rabies in coyotes and gray foxes along the border with Mexico. A field evaluation investigating effectiveness of ONRAB in Texas coyotes was also initiated in FY22, resulting in approximately 70,000 ONRAB baits distributed across 3,000 km^2 (1,200 mi^2) in the northern panhandle of the state. In the eastern US, 45% of the ORV baits distributed were ONRAB. The total area baited in FY22 was 169,000 km^2 (65,251 mi^2, an area almost the size of Missouri), and the total distance flown was >408,000 km (>253,000 mi; about 10.2 times around the Earth's equator) over 1,900 hours.

Progress Toward Raccoon Rabies Elimination

Progress toward raccoon rabies elimination is measured annually as a result of moving all or portions of current ORV zones into areas where raccoon variant remains enzootic (generally east or south). The NRMP continued to make progress toward raccoon rabies elimination by removing 13,000 km^2 (5,000 mi^2) from the zones in MA, NC, NH, NY, OH, TN, VA, VT, and WV because raccoon rabies had been eliminated from those management areas. This included removing an additional 12 km (7 mi) of ORV zone in NY, VT and NH, where the ORV zone is now 44 km (27 mi) off of the Canada border (previously the ORV zone in these states was established along the international border). In contrast, 17,000 km^2 (6,600 mi^2) were added to ORV zones in AL, GA, NC, and TN as new areas under management to prevent the spread of raccoon rabies to the west into Mississippi.

Enhanced Rabies Surveillance

In cooperation with the Centers for Disease Control and Prevention (CDC), Dr. Charles Rupprecht of LYSSA LLC, the New York State Department of Health Wadsworth Laboratory and state agriculture, health, and fish and wildlife agencies, the NRMP continued to use the Direct Rapid immunohistochemistry Test (DRIT) for rabies antigen testing. In FY22, WS collected and tested 6,391 animals from 18 states to enhance rabies surveillance. WS tested 4,887 (76%) samples from 17 states using the DRIT; 83 of these samples were confirmed rabid from 12 states. ERS samples collected were wildlife not involved in a human or domestic animal rabies exposure and may have otherwise not been tested through the public health surveillance system.

ORV Program Monitoring

In FY22, 4,325 blood and 175 tooth samples were collected in 14 states in the eastern US to estimate rabies antibody levels and bait uptake in target species within ORV zones or in ERS areas. Lab results are pending in all states, but historically annual sero-conversion rates average 31% in raccoons when using RABORAL V-RG® and 54% when using ONRAB. In Texas, serology results are pending for RABORAL V-RG® but typically average 57% for coyotes and 76% for gray fox after bait distribution. The post-ONRAB RVNA response in coyotes was 71% for January 2022.

Rabies Research in Raccoons (Eastern US)

In FY22, the NRMP continued its collaboration with the WS National Wildlife Research Center (NWRC) on 13 studies related to raccoon rabies virus variant (RRVV). Seven of the studies involved human developed habitats as we continue to try and optimize ways to eliminate RRVV from urban/suburban areas, These studies include: (1) Home range, movements, and habitat selection of striped skunks and raccoons in urban-suburban Burlington VT; (2) Comparison of hand baiting and bait stations as methods of distributing oral rabies vaccine baits in Greater Birmingham, Alabama (3) Home range, movements, and habitat selection of opossums relative to an ORV program in urban-suburban Burlington, VT; (4) Optimizing baiting designs for oral rabies vaccines in urban and suburban landscapes; (5) The role of urban environments in the landscape level circulation of rabies virus in raccoons; (5) Seroconversion of raccoons to ONRAB baiting by hand versus helicopter in Chattanooga and Cleveland, Tennessee; and (6) A comparison of oral rabies vaccination (ORV) strategies and vaccine bait uptake in urban-suburban Burlington, VT. In FY22, the NRMP and the NWRC Rabies Project authored or co-authored 9 published manuscripts/book chapters and had another 11 papers in press, in revision or in review.

Evaluating RABORAL V-RG® “Special High Titer”

In FY22, the NRMP and NWRC concluded evaluating RABORAL V-RG® “Special High Titer” (SHT) vaccine by distributing baits in North Carolina (36,900) and Maine (37,800) and completing trapping to collect raccoon blood samples for evaluation of RVNA. In NC, the 3-yr mean post-bait RVNA response in raccoons was 35% (Yr1: 56%, Yr2: 25%, Yr3: 25%). The puzzling decline in years 2 and 3 isn’t easily explained. In ME, the 2-yr mean post-bait RVNA response in raccoons was 50% (Yr1: 52%, Yr2: 49%, Yr3: pending). We expect ME 2022 (year 3) results in FY23.

Rabies Research in Small Asian Mongoose (Puerto Rico)

In FY22, NWRC research continued to guide the development of oral rabies vaccination strategies targeting small Asian mongoose populations across key habitats in Puerto Rico. Modeling research has

demonstrated the importance of habitat level factors driving variation in mongoose population densities and movements. Active field studies included evaluations of target and non-target placebo oral rabies vaccine bait uptake in mixed forest habitats. Additional surveys of mongoose population density have been carried out in high elevation ("cloud") forest habitats and agricultural areas to expand upon previous surveys from dry forest, grassland and rainforest habitats. Ongoing work has also included evaluations of domestic dog abundance in key habitats for cooperator-led collaborative studies to document and characterize domestic animal and mongoose contact rates and interactions. Finally, the Rabies Environmental Coordinator completed a draft EA for a Ceva Santé Animale oral rabies vaccine (Rabitec M) field trial in Puerto Rico to manage rabies in mongoose during FY21, which was translated to Spanish during FY22 and distributed to the Puerto Rico Department of Natural and Environmental Resources and the Puerto Rico Department of Health for review.

Vampire Bat Surveillance

Due to the continued potential movement of vampire bats northward from Mexico into the United States and to provide monitoring for early detection, AZ, FL, NM, and TX conducted 159 surveys of livestock sales barns, ranches, feedlots, and dairy barns during FY22. More than 76,000 cattle were examined during these surveys, with no evidence of bat bites recorded.

Wildlife Services National Rabies Management Program www.aphis.usda.gov/wildlife-damage/rabies

Contact: richard.b.chipman@usda.gov

Feral Swine Disease Surveillance

The National Feral Damage Management Program focused surveillance efforts on evaluating feral swine for the presence of antibodies to classical swine fever (CSF), pseudorabies (PRV), and swine brucellosis (SB). Between 2018 and 2022, nation-wide seroprevalence bounced between ~18.5 and 24% for PRV and ~6.5 and 15% for SB, and zero for CSF.

Year	Disease	Total samples tested	Total samples positive	Percent positive
2022	CSF	7,633	0	0
	PRV	6,100	1,139	18.7
	SB	6,085	411	6.8
2021	CSF	6,555	0	0
	PRV	6,534	1,403	21.5
	SB	6,517	947	14.5
2020	CSF	4,013	0	0
	PRV	4,003	978	24.4
	SB	3,994	408	10.2
2019	CSF	3,537	0	0
	PRV	3,503	798	22.8
	SB	3,476	199	5.7
2018	CSF	2,868	0	0
	PRV	3,002	558	18.6
	SB	3,000	186	6.2

Figure 5. Table showing the number of samples tested, the number of samples positive, and the percent of samples positive for CSF, PRV, and SB by year since 2018.

A new surveillance approach was rolled out in FY21 which is designed as a risk-based detection system for foreign animal diseases, including CSF, ASF, and FMD. Also, sample size increased by 2x – the new sampling target is now approximately 6,000 animals. WS is on track to reach the sample target for FY23.

African Swine Fever (ASF)

The recent detection of African Swine Fever (ASF) in the Dominican Republic has initiated an APHIS-level response, due to the proximity to Puerto Rico and the Virgin Islands. Wildlife Services is assisting in the response by removing feral and free roaming swine and provide enhanced surveillance in Puerto Rico, the US Virgin Islands, and is currently developing operational and surveillance activities in high-risk US states. Specifically, WS is organizing the deployment of Wildlife Disease Biologists, Feral Swine/Wildlife

Specialists, and technicians to Puerto Rico to assist with operational removal and disease sampling of feral/free ranging swine. Deployment rotations began in August 2021 and in that time, over 4,000 animals have been dispatched and 2,600 have been sampled by antigen and antibody-based diagnostics for both ASF and CSF.

Additionally, four states within the continental U.S. (FL, GA, LA, TX) were determined to be at very high risk for ASF virus introduction based on the Caribbean risk pathway. In May 2022, Wildlife Services initiated active surveillance ASF in specific counties within those four states. To date, over 2,100 samples have been tested by PCR and ELISA for ASF from the conterminous U.S.

National Feral Swine Damage Management Program

Contact: dana.j.cole@usda.gov

Recent Wildlife Services Publications

Bevins, S.N., S.A. Shriner, J.C. Cumbee, K.E. Dilione, K.E. Douglass, J.W. Ellis, M.L. Killian, M.K. Torchetti, and J.B. Lenoch. 2022. Intercontinental movement of H5 2.3.4.4 highly pathogenic avian influenza A(H5N1) to the United States, 2021. Emerging Infectious Diseases 28(5):1006-1011. doi: 10.3201/eid2805.220318

Bosco-Lauth, A.M., S.M. Porter, K.A. Fox, M.E. Wood, D. Neubaum, and M. Quilici. 2022. Experimental infection of Brazilian free-tailed bats (Tadarida brasiliensis) with two strains of SARS-CoV-2. Viruses 14(8):1809. doi: 10.3390/v14081809

Brandell, E.E., M.K. Jackson, P.C. Cross, A.J. Piaggio, D.R. Taylor, D.W. Smith, B. Boufana, D.R. Stahler, and P.J. Hudson. 2022. Evaluating noninvasive methods for estimating cestode prevalence in a wild carnivore population. PLoS ONE 17(11): e0277420. doi: 10.1371/journal.pone.0277420

Byas, A.D., E.N. Gallichotte, A.E. Hartwig, S.M. Porter, P.W. Gordy, T.A. Felix, R.A. Bowen, G.D. Ebel, and A.M. Bosco-Lauth. 2022. American alligators are capable of West Nile virus amplification, mosquito infection and transmission. Virology 568:49-55. doi: 10.1016/j.virol.2022.01.009

Carlson, C.J., S.N. Bevins, and B.V. Schmid. 2022. Plague risk in the western United States over seven decades of environmental change. Global Change Biology 28(3):753-769. doi: 10.1111/gcb.15966

Elmore, S.A., C. Fehlner-Gardiner, É. Bouchard; G. Samelius; R.T. Alisauskas, K.P. Huyvaert; R.B. Chipman, E.J. Jenkins, and A.T. Gilbert. 2022. Evidence of arctic fox (Vulpes lagopus) survival following exposure to rabies virus. Journal of Wildlife Diseases 58(1):241-244. doi: 10.7589/JWD-D-21-00071

Franklin, A.B. 2022. SARS-CoV-2 in wildlife. pgs 337-346. In: P. Fronek and K.S. Rotabi-Casares, editors. Social work in health emergencies: Global perspectives. Routledge, London, Great Britain.

Gilbert, A.T., R.M. Wallace, and C.E. Rupprecht. 2022. Special issue "Innovative techniques and approaches in the control and prevention of rabies virus." Viruses 14(5):845. doi: 10.3390/v14050845

Guan, M., A.K. Olivier, X. Lu, W. Epperson, X. Zhang, L. Zhong, K. Waters, N. Mamaliger, L. Li, F. Wen, Y.J. Tao, T.J. DeLiberto, and X.-F. Wan. 2022. The Sialyl Lewis X Glycan Receptor Facilitates Infection of Subtype H7 Avian Influenza A Viruses. Journal of Virology 96(19): e01344-22 doi: 10.1128/jvi.01344-2

Hamond, C., A.S. Browne, L.H. de Wilde, R.L. Hornsby, K. LeCount, T. Anderson, T. Stuber, H.M. Cranford, S.K. Browne, G. Blanchard, D. Homer, M.L. Taylor, M.Evans, N.F. Angeli, J. Roth, K.M. Bisgard, J.S. Salzer, I.J. Schafer, B.R. Ellis, D.P. Alt, L. Schlater, J.E. Nally, and E.M. Ellis. 2022. Assessing rodents as carriers of pathogenic Leptospira species in the U.S. Virgin Islands and their risk to animal and public health. Scientific Reports 12:1132. doi: 10.1038/s41598-022-04846-3

Kading, R.C., E.M. Borland, E.C. Mossel, T. Nakayiki, B. Nalikka, J.P. Ledermann, M.B. Crabtree, N.A. Panella, L. Nyakarahuka, A.T. Gilbert, J.C. Kerbis-Peterhans, J.S. Towner, B.R. Amman, T.K. Sealy, B.R. Miller, J.J. Lutwama, R.M. Kityo, and A.M. Powers. 2022. Exposure of Egyptian rousette bats (Rousettus aegyptiacus) and a little free-tailed bat (Chaerephon pumilus) to alphaviruses in Uganda. Diseases 10(4):121. doi: 10.3390/diseases10040121

Kent, C.M., A.M. Ramey, J.T. Ackerman, J. Bahl, S.N. Bevins, A.S. Bowman, W.M. Boyce, C.J. Cardona, M.L. Casazza, T.D. Cline, S.E. De La Cruz, J.S. Hall, N.J. Hill, H.S. Ip, S. Krauss, J.M. Mullinax, J.M. Nolting, M. Plancarte, R.L. Poulson, J.A. Runstadler, R.D. Slemons, D.E. Stallknecht, J.D. Sullivan, J.Y. Takekawa, R.J. Webby, R.G. Webster, and D.J. Prosser. 2022. Spatiotemporal changes in influenza A virus prevalence among wild waterfowl inhabiting the continental United States throughout the annual cycle. Scientific Reports 12(1):13083. doi: 10.1038/s41598-022-17396-5

Lee, S., P. Fan, T. Liu, A. Yang, R.K. Boughton, K.M. Pepin, R.S. Miller, and K.C. Jeong. 2022. Transmission of antibiotic resistance at the wildlife-livestock interface. Communications Biology 5:585. doi: 10.1038/s42003-022-03520-8

Kimpston, C.N., A.L. Hatke, B. Castelli, N. Otto, H.S. Tiffin, E.T. Machtinger, J.D. Brown, K.R. Van Why, and R.T. Marconi. 2022. High prevalence of antibodies against canine parvovirus and canine distemper virus among coyotes and foxes from Pennsylvania: Implications for the intersection of companion animals and wildlife. Microbiology Spectrum 10(1): e02532-21. doi: 10.1128/spectrum.02532-21

McClure, K.M., G. Bastille-Rousseau, A.J. Davis, C.A. Stengel, K.M. Nelson, R.B. Chipman, G. Wittemyer, Z. Abdo, A.T. Gilbert, and K.M. Pepin. 2022. Accounting for animal movement improves vaccination strategies against wildlife disease in heterogeneous landscapes. Ecological Applications 32(4): e2568. doi: 10.1002/eap.2568

Miller, R.S., S.N. Bevins, G. Cook, R. Free, K.M. Pepin, T. Gidlewski, and V.R. Brown. 2022. Adaptive risk-based targeted surveillance for foreign animal diseases at the wildlife-livestock interface. Transboundary and Emerging Diseases 69(5): e2329-e2340. doi: 10.1111/tbed.14576

Mohamed, F., T. Gidlewski, M.L. Berninger, H.M. Petrowski, A.J. Bracht, C. Bravo de Rueda, R.W. Barrette, M. Grady, E.S. O'Hearn, C.E. Lewis, K.E. Moran, T.L. Sturgill, L. Capucci, and J.J. Root. 2022. Comparative susceptibility of eastern cottontails and New Zealand white rabbits to classical rabbit hemorrhagic disease virus (RHDV) and RHDV2. Transboundary and Emerging Diseases 69(4): e968-e978. doi: 10.1111/tbed.14381

Pepin, K.M., V.R. Brown, A. Yang, J.C. Beasley, R. Boughton, K.C. VerCauteren, R.S. Miller, and S.N. Bevins. 2002. Optimizing response to an introduction of African swine fever in wild pigs. Transboundary and Emerging Diseases 69(5): e3111-e3127. doi: 10.1111/tbed.14668

Podgórsk, T., K.M. Pepin, A. Radko, A. Podbielska, M. Łyjak, G. Woźniakowski, and T. Borowik. 2022. How do genetic relatedness and spatial proximity shape African swine fever infections in wild boar? Transboundary and Emerging Diseases 69(5):2656-2666. doi: 10.1111/tbed.14418

Ramey, A.M., N.J. Hill, T.J. DeLiberto, S.E.J. Gibbs, M.C. Hopkins, A.S. Lang, R.L. Poulson, D.J. Prosser, J.M. Sleeman, D.E. Stallknecht, and X.-F. Wan. 2022. Highly pathogenic avian influenza is an emerging disease threat to wild birds in North America. The Journal of Wildlife Management 86(2): e22171. doi: 10.1002/jwmg.22171

Root, J.J., J.W. Ellis, and S.A. Shriner. 2022. Strength in numbers: Avian influenza A virus transmission to poultry from a flocking passerine. Transboundary and Emerging Diseases 69(4): e1153-e1159. doi: 10.1111/tbed.14397

Shriner, S.A., J.J. Root, J.W. Ellis, K.T. Bentler, K.K. VanDalen, T. Gidlewski, and S.N. Bevins. 2022. Influenza A virus surveillance, infection, and antibody persistence in snow geese (Anser caerulescens). Transboundary and Emerging Diseases 69(2):742-752. doi: 10.1111/tbed.14044

Smith, M.M., C. Van Hemert, T.C. Atwood, D.R. Sinnett, J.W. Hupp, B.W. Meixell, D.D. Gustine, L.G. Adams, and A.M. Ramey. 2022. A serologic survey of Francisella tularensis exposure in wildlife on the arctic coastal plain of Alaska. Journal of Wildlife Diseases 58(4):746-755. doi: 10.7589/JWD-D-21-00162

Stallknecht, J.D. Sullivan, J.Y. Takekawa, R.J. Webby, R.G. Webster, and D.J. Prosser. 2022. Spatiotemporal changes in influenza A virus prevalence among wild waterfowl inhabiting the continental United States throughout the annual cycle. Scientific Reports 12(1):13083. doi: 10.1038/s41598-022-17396-5

Tillis, S.B., J.M. Josimovich, M.A. Miller, L.L. Hoon-Hanks, A.M. Hartmann, N.M. Claunch, M.E. Iredale, T.D. Logan, A.A. Yackel Adams, I.A. Bartoszek, J.S. Humphrey, B.M. Kluever, M.D. Stenglein, R.N. Reed, C.M. Romagosa, J.F.X. Wellehan, and R.J. Ossiboff. 2022. Divergent serpentoviruses in free-ranging invasive pythons and native colubrids in Southern Florida, United States. Viruses 14(12):2726. doi: 10.3390/v14122726

Wilber, M.Q., A. Yang, R. Boughton, K.R. Manlove, R.S. Miller, K.M. Pepin, and G. Wittemyer. 2022. A model for leveraging animal movement to understand spatio-temporal disease dynamics. Ecology Letters 25(5):1290-1304. doi: 10.1111/ele.13986