

## **AGENDA**

Board of Wildlife Resources  
Wildlife and Boat Committee  
7870 Villa Park Drive  
Henrico, Virginia 23228

October 22, 2025  
9:00 am

Committee Members: Mr. Jon Cooper, Chair, Mr. James Edmunds, Vice Chair, Ms. Laura Walters, Mr. Lynwood Broaddus (Alternate), Mr. Will Wampler (Alternate)

DWR Staff Liaisons: Mr. Michael Lipford, Dr. Mike Bednarski, Ms. Stacey Brown, and Ms. Amy Martin

1. Call to Order and Welcome  
Mr. Cooper
2. Approval of the August 20, 2025, Committee Meeting Minutes **Final Action**  
Mr. Cooper
3. Public Comment – Non - Agenda Item  
Mr. Cooper
4. Turkey Regulation Proposal **Final Action**  
Mr. Mike Dye
5. Blue Catfish Regulation Proposal **Final Action**  
Dr. Mike Bednarski
6. Regulatory Reform Proposals **Final Action**  
Mr. Aaron Proctor
7. Mange Management Plan **Final Action**  
Dr. John Tracey

8. Virginia Sea Turtle & Marine Mammal Conservation Plans  
Ms. Amy Martin
9. VPA-HIP Program Accomplishments  
Mr. Cale Godfrey
10. Wildlife Division Report  
Mr. Michael Lipford
11. Fish Division Update  
Dr. Mike Bednarski
12. Boating Division Update  
Ms. Stacey Brown
13. Non-game Program Update  
Ms. Amy Martin
14. Director's Report  
Mr. Ryan Brown
15. Chair's Report  
Mr. Cooper
16. Next Meeting Date: Wednesday, January 21, 2026  
Mr. Cooper
17. Additional Business/Comments  
Mr. Cooper
18. Adjournment  
Mr. Cooper

Draft Meeting Minutes  
Wildlife and Boat Committee  
Board of Wildlife Resources  
7870 Villa Park Drive – Board Room  
Henrico, VA 23228

August 20, 2025  
9:00 am

**Present:** Mr. Jon Cooper, **Chair**, Mr. James Edmunds, **Vice Chair**, Ms. Laura Walters, Mr. Will Wampler (alternate), Mr. Lynwood Broaddus (alternate) **Board Members** in attendance: Ms. Marlee Dance, Mr. Michael Formica, Mr. Parker Slaybaugh, Mr. George Terwilliger; **Executive Director:** Mr. Ryan Brown; **Deputy Directors:** Ms. Becky Gwynn and Mr. Darin Moore; **Director's Working Group:** Dr. Mike Bednarski, Ms. Stacey Brown, Mr. George Braxton, Mr. Michael Lipford, Ms. Shelby Crouch, Mr. Bob Smet, Mr. Paul Kugelman, Ms. Rebecca Lane, (virtual)

The Committee Chair called the meeting to order at 9:00 am and welcomed everyone. The Chair noted for the record that a Quorum was present for today's meeting.

**Approval of the May 21, 2025, Committee Meeting Minutes:**

The Chair called for a motion to approve the May 21, 2025, Wildlife and Boating minutes. Ms. Walters made a motion to approve the minutes of the May 21, 2025, committee meeting. Mr. Edmunds seconded the motion. Ayes: Cooper, Edmunds, Walters, Wampler, Broaddus

**Public Comment - Non-Agenda Item:** The Chair called for Public Comment – Non-Agenda Items.

- Gary Kimberlin spoke regarding dog hunting
- Alexis Zeigler spoke regarding dog hunting (v)
- Judge Charlton spoke regarding dog hunting (v)

**Turkey Regulation Proposal:** Mr. Cooper called on Mr. Cale Godfrey for a presentation.

Mr. Godfrey gave a presentation on the Turkey Regulation Proposal.

After comments and questions, The Chair thanked Mr. Godfrey for his presentation of the Turkey Regulation Proposal.

The Chair called for a motion, Mr. Edmunds made a motion, I move that the Wildlife and Boat Committee recommend to the Board of Wildlife Resources proposing the amendment to the wild turkey bag limit regulation as presented by staff. It was second by Mr. Wampler.

Ayes: Cooper, Edmunds, Wampler, Walters, Broaddus.

**Blue Catfish Regulation Proposal:** Mr. Cooper called on Dr. Mike Bednarski for a presentation.

Dr. Bednarski presented the Blue Catfish Regulation Proposal.

After comments and questions, the Chair thanked Dr. Bednarski for his presentation on the Blue Catfish Regulation Proposal.

- John Williams spoke regarding the Blue Catfish Regulation Proposal
- Christian Moore spoke regarding the Blue Catfish Regulation Proposal
- Trey Thorp spoke regarding the Blue Catfish Regulation Proposal
- Walter Coleman spoke regarding the Blue Catfish Regulation Proposal
- Robert Barrell spoke regarding the Blue Catfish Regulation Proposal
- Olivia Hoffman spoke regarding the Blue Catfish Regulation Proposal (v)

The Chair called for a motion, Mr. Edmunds made a motion, Mr. Chair, I move that the Wildlife and Boat Committee of the Virginia Department of Wildlife Resources put forward staff's regulatory recommendations on blue catfish to the full Board. It was seconded by Mr. Cooper.

Ayes: Cooper, Edmunds, Walters, Broaddus, Wampler

**Regulatory Reform Proposals:** Mr. Cooper called on Mr. Aaron Proctor for a presentation.

Mr. Proctor presented the proposed regulatory reform actions staff has outlined to accomplish an overall 25% in regulatory mandates per Governor Youngkins Executive Order 19.

After comments and questions, the Chair thanked Mr. Proctor for his presentation.

The Chair called for a motion, Mr. Edmunds, made a motion, Mr. Chair, I move that the Wildlife and Boat Committee approve the staff recommendations to meet the Agency's goal of 25% regulatory reduction per Executive Order 19, and that they are put forward for public comment.

Mr. Cooper seconded the motion, Ayes: Cooper, Edmunds, Walters, Broaddus, Wampler

**Aquatics, Boating & Nongame Regulations Schedule:** Mr. Cooper called on Dr. Bednarski for a presentation.

Dr. Bednarski presented the 2025-2026 Committee and Board Meeting Schedule.

Mr. Wampler requested the LIS report on the Blue Cat Regulation Proposal.

After comments and questions, the Chair thanked Dr. Bednarski for his presentation.

The Chair called for a motion; Mr. Edmunds made a motion. Mr. Chair, I move that the Wildlife and Boat Committee support the proposed meeting schedule as presented by staff. It was seconded by Ms. Walters. Ayes: Cooper, Edmunds, Walters, Broadus, Wampler

**Wildlife Action Plan Revision:** The Chair called on Mr. Jeff Trollinger for a presentation.

Mr. Trollinger presented the Wildlife Action Plan Revision.

After comments and questions, The Chair thanked Mr. Trollinger for his presentation.

The Chair call for a motion, Mr. Broaddus made a motion. Mr. Chair, I move that the Wildlife and Boat Committee recommend that the Board endorse the 2025 VA Wildlife Action Plan as presented by staff. It was seconded by Ms. Walters. Ayes: Mr. Cooper, Mr. Edmunds, Ms. Walters, Mr. Broaddus, Mr. Wampler

**Manage Management Plan & Response Protocol:** The Chair called on Mr. Michael Lipford for a presentation.

Mr. Lipford presented the Manage Management Plan & Response Protocol.

After comments and questions, the Chair thanked Mr. Lipford for his presentation.

**Wildlife Division Report:** The Chair called on Mr. Michael Lipford for a Wildlife Division Report.

Mr. Lipford reported:

- Deer Management Plan being updated – revision to begin by 2026
- CWD Management Plan being updated - to be completed January 2026
- Gave an enhanced Upland Bird Hunting update
- Strategic Plan is complete
- Hemorrhagic disease - fewer calls coming in
- Deer with no hair - so far this year deer are normal looking

After comments and questions, the Chair thanked Mr. Lipford for his report.

**Fish Division Report:** The Chair called on Dr. Mike Bednarski for a Fish Division Update.

Dr. Bednarski reported:

- Attended the I Cast Conference in Florida
- Fish growth at the hatcheries

After comments and questions, the Chair thanked Dr. Bednarski for his report.

**Boating Division Update:** The Chair called on Ms. Stacey Brown for a Boating Division Update.

Ms. Brown reported:

- Introduced Mr. Travis Park as the new Waterways Manager
- 60,000 Customer contacts
- 18,000 students took a boating safety course
- 60 total incidents which includes 9 fatalities, 33 injuries and 27 incidents that had damage over \$2,000 or a total loss of vessel
- Boating and Education staff are putting the finishing touches on updating the classroom course curriculum
- Selected by NASBLA to be one of two state to pilot a paddle craft training program
- Boating staff attended numerous events this summer to promote awareness around boating safety messages
- NASBLA Virginia Boating Educator of the Year award was presented to Michael Reiss at the Hoffler Creek Wildlife Preserve in Portsmouth, VA

After comments and questions, The Chair thanked Ms. Brown for you update

**Non-game Program Update:** The Chair called on Ms. Amy Martin for a Non-game Program Update.

Ms. Martin reported:

- From May of this year through the end of summer. we will have released 1,238 federally endangered candy darters in Cripple Creek, Wythe County.
- On July 17, 2025, the Secretary of Natural Resources and her deputy accompanied our Malacologist, Brian Watson on a visit of one of our mussel restoration sites in the South River
- Genetic samples from wild woodrats captured in Ohio show offspring from a dam and sire that originated from Virginia. The Toledo Zoo is expecting pups in mid-August from two woodrats that originated from Virginia. These pups are slated for reintroduction in Indiana. This shows that the reintroduction effort is working and that individuals can survive and reproduce in the wild. Captive breeding is working with respect to producing offspring and hopefully after release Indiana will pick up the genetics of the captive

offspring in the future. I'm in contact with Dr. McShea (Smithsonian Institute Front Royal) to see if we can get SI involved in captive rearing. So far VA has donated woodrats to 4 zoos (Baltimore Zoo, Zoo America, Toledo Zoo, and Greensboro Science Center (NC).

- This year had the highest number of natural cliff face mountain PEFA pairs documented since reintroduction efforts began in the VA mountains in 1985. Total of 6 pairs, including 3 in Giles County (2 of them along the New River), 2 in Rockbridge County (including our own Jump Mtn WMA), and Breaks Interstate Park in Dickenson County. We were able to confirm 10 banding-age or older young, of which at least 7 fledged, though the total number of young produced was likely higher. Highlights included a banded VA bird (the adult female of the pair at one of the Giles County sites), which I was able to get a partial band ID on – she hatched at one of two sites on the Eastern Shore or here in Richmond (meaning that she would have been banded by myself or Steve) – hope that she is back next year and we can get a full read on her bands to definitively identify her.
- The relocated seabird colony to Ft. Wool and the barges at the HRBT is nearly finished for the season. The key outcomes from this year are:
  - Almost the entire royal tern population on the barges this year, which displaced many of the black skimmers, common terns and gull-billed terns that nested on the barges in past years.
  - The extreme heat wave that hit VA the third week in June was the likely cause of a significant mortality event that affected royal tern chicks on the barges. In response, DWR and the VA Tech Shorebird Program moved roughly 2,500 chicks from the barges to Ft. Wool where they released and joined by the attending adults.
  - Preliminary results indicate that royal tern breeding pairs were up from last year and large numbers of relocated chicks fledged successfully from Ft. Wool.
- For a second year in a row, DWR staff participated in Project Poop, a collaborate seabird diet study along the Atlantic coast that involves the collection of fecal samples from Common tern and black skimmer chicks to identify ingested prey items through DNA analyses. DWR collected 71 common tern samples and 85 black skimmer samples from two seabird colonies on Virginia's barrier islands. Staff also banded 39 COTE chicks and 50 BLSK chicks during this effort. This year, a total of 12 states and two provinces collected samples from 36 colonies. 2024 BLSK analyses are nearly complete and will be presented at the Waterbird Society meeting in Sept.

After comments and questions, the Chair thanked Ms. Martin for her update.

**Director's Report:** The Chair called on Mr. Ryan Brown for a Director's report.

Mr. Brown reported:

- Work continues the Cumberland Outdoor Easement in Southwest VA
- October 11-17, 2025, Elk hunt
- Jackie Rosenberg will receive the Young Professional Award at AFWA Conference

**Chair's Report:** The Chair asked if there were any additional business or comments, hearing none, he announced the next meeting to be Wednesday, October 22, 2025, and adjourned the meeting at 12:00 pm.

Respectfully Submitted,  
Frances Boswell  
/s/

**4VAC15-240-70.**  
**Game: Turkey: Bag limit.**

**Summary:**

The recommendation is to modify the annual bag limit to eliminate the restriction that no more than two turkeys may be taken during the fall seasons and allow for the take of only one beardless turkey during the license year.

**Recommended language of amendment:**

The bag limit for hunting turkeys shall be one a day, three a license year, no more than ~~two~~ **one** of which may be ~~taken in the fall~~ **beardless**.

**Staff Final Recommendation – Staff recommends adoption of the amendments as final in the form they were proposed.**

**Rationale:**

Public concerns over lower than desired turkey populations in some regions of the state prompted members of the DWR Board of Wildlife Resources to request a reduction in the harvest of beardless turkeys. The proposed reduction in the bag limit for beardless turkeys is intended to protect additional females from harvest, thereby enhancing their potential reproductive output and potentially increasing turkey population. Additionally, this regulation amendment will expand the fall hunting bag limit, enabling fall hunters to take all three of their annual bag limit for turkeys in the fall season, if desired.

## Regulation Reduction – Final Amendments

October 22-23, 2025 Board of Wildlife Resources

### **4VAC15-20-100. Prohibited use of vehicles on department-owned lands.**

It shall be unlawful on department-owned lands to drive through or around gates designed to prevent entry with any type of motorized vehicle or to use such vehicles to travel anywhere on such lands except on roads open to vehicular traffic. ~~Any motor-driven vehicle shall conform with all state laws for highway travel; provided, that this requirement shall not apply to the operation of motor vehicles for administrative purposes by department authorized personnel on department-owned lands.~~ Nothing in this section shall be construed to prohibit the use of Class one or Class two electric power-assisted bicycles as defined in § [46.2-100](#) of the Code of Virginia where traditional bicycles are allowed. Class three electric power-assisted bicycles as defined in § [46.2-100](#) are prohibited. Nothing in this section shall be construed to prohibit the department from allowing the use of wheelchairs or other power-driven mobility devices by individuals with mobility disabilities in accordance with the federal Americans with Disabilities Act of 1990 (P.L. 101-336, 104 Stat. 327).

For the purposes of this section, the term "wheelchair" means a manually operated or power-driven device designed primarily for use by an individual with a mobility disability for the main purpose of indoor, or of both indoor and outdoor, locomotion. "Other power-driven mobility device" means any mobility device powered by batteries, fuel, or other engines, whether or not designed primarily for use by individuals with mobility disabilities, that is used by individuals with mobility disabilities for the purpose of locomotion, including golf cars, electronic personal assistive mobility devices, or any mobility device designed to operate in areas without defined pedestrian routes, but that is not a wheelchair within the meaning of this section.

Rationale: This is an unnecessary mandate that would be covered by DOT regulations for vehicular operation and standards on state/public roads.

### **~~4VAC15-20-110. Refusal to surrender licenses, permits, stamps, or records to department representatives. (REPEAL)~~**

~~No agent, or any other person for him, in possession of issued or unissued hunting, fishing or trapping licenses, permits, stamps, or records pertaining to them, shall refuse to surrender upon demand such licenses, permits, stamps or records to department representatives authorized by the director to take such licenses, permits, stamps, and records into custody.~~

Rationale: With paper licenses and records no longer issued, this is an unnecessary section that can be repealed and reduces our regulatory burden by one mandate. The official licensing system used by DWR is all online.

**4VAC15-20-155. Camping on Wildlife Management Areas and other department-owned or department-managed lands.**

~~A. Temporary dispersed camping, with no amenities provided, may only be performed on Wildlife Management Areas (WMAs) and other department-owned or managed lands when occupants are engaged in authorized activities and in strict compliance with established terms and conditions, including those listed in this section. Camping may be prohibited on certain portions or entire parcels of department-owned or managed lands, including certain WMAs.~~

B. Authorization. It shall be unlawful to camp without ~~written authorization from the department.~~ an approved camping authorization form. ~~Written authorization to camp is required in addition to any and all other licenses, permits or authorizations that may otherwise be required. Written authorization is obtained by completing and submitting a Camping Authorization Form. Only an individual 18 years of age or older who is a member of and accepts responsibility for the camp and camping group may be issued a camping authorization.~~

C. Camping periods. Unless otherwise posted or authorized, it shall be unlawful to camp for more than 14 consecutive nights, or more than 14 nights in a 28-day period on department-owned or controlled lands. ~~At the end of the authorized camping period, all personal property and any refuse must be removed.~~

D. Prohibited locations. Camping is allowed only at previously cleared and established sites. No vegetation may be cut, damaged, or removed to establish a camp site. It shall be unlawful to camp within 300 feet of any department-owned lake, boat ramp or other facility. It shall be unlawful to camp at other specific locations as posted. This section shall not prohibit active angling at night along shorelines where permitted.

E. Removal of personal property and refuse. Any person who establishes or occupies a camp shall be responsible for the complete removal of all personal property and refuse when the camping authorization has expired. Any personal property or refuse that remains after the camping authorization has expired shall be considered litter and punishable pursuant to § 33.2-802 of the Code of Virginia.

F. It shall be unlawful when camping on department-owned or managed lands to store or leave unattended any food (including food for pets and livestock), refuse, bear attractant, or other wildlife attractant unless it is (i) in a bear-resistant container; (ii) in a trunk of a vehicle or in a closed, locked, hard-sided motor vehicle with a solid top; (iii) in a closed, locked, hard-body trailer; or (iv) suspended at least 10 feet clear of the ground at all points and at least four feet horizontally from the supporting tree or pole and any other tree or pole. It shall be unlawful to discard, bury, or abandon any food, refuse, bear attractant, or other wildlife attractant unless it is disposed of by placing it inside an animal-resistant trash receptacle provided by the department.

G. Any violation of this section or other posted rules shall be punishable as a Class III misdemeanor, and the camping permit shall become null and void. The permittee shall be required to immediately vacate the property upon summons or notification. A second or subsequent offense may result in the loss of camping privileges on department-owned or managed properties.

Rationale: The striking of subsection A lends to regulatory simplification and reduction of unnecessary oversight. Subsection B now references the correct form required to camp and also removes unnecessary mandates regarding the administrative process of obtaining a camping form. The portion struck from subsection C is duplicative of language in subsection E regarding removal of personal property and refuse.

#### **4VAC15-20-160. Nuisance species designated.**

A. The board hereby designates the following species as nuisance species pursuant to § [29.1-100](#) of the Code of Virginia.

1. Mammals.

- a. House mouse (*Mus musculus*);
- b. Norway rat (*Rattus norvegicus*);
- c. Black rat (*Rattus rattus*);
- d. Coyote (*Canis latrans*);
- e. Feral hog (*Sus scrofa*; any swine that are wild or for which no proof of ownership can be made);
- f. Nutria (*Myocastor coypus*); and
- g. Woodchuck (*Marmota monax*).

2. Birds.

- a. European starling (*Sturnus vulgaris*);
- b. English (house) sparrow (*Passer domesticus*); and
- c. Pigeon (Rock Dove) (*Columba livia*).
- d. Other nonnative species as defined in the Migratory Bird Treaty Reform Act of 2004 and regulated under 50 CFR 10.13.

~~B. It shall be unlawful to take, possess, transport, or sell all other wildlife species not classified as game, furbearer or nuisance, or otherwise specifically permitted by law or regulation.~~

Rationale: §29.1-520(10) covers what subsection B is saying, so it can be stricken.

**4VAC15-20-210. Definitions; nonindigenous aquatic nuisance species.**

A. In addition to the species already listed in § 29.1-571 of the Code of Virginia, the board hereby designates the following species as nonindigenous aquatic nuisance species pursuant to § 29.1-100 of the Code of Virginia.

1. Fish.
  - a. Black carp (*Mylopharyngodon piceus*)
2. Invertebrates.
  - a. New Zealand mudsnail (*Potamopyrgus antipodarum*)
  - b. Rusty crayfish (*Orconectes rusticus*)
  - c. Chinese mitten crab (*Eriocheir sinensis*)
  - d. Marbled crayfish (*Marmorkrebs* – genus *Procambarus*)

~~B. It shall be unlawful to take, possess, transport, import, sell, or offer for sale within the Commonwealth any nonindigenous aquatic nuisance species except as authorized by law or regulation.~~

Rationale: §29.1-574(A) covers what subsection B is saying, so it can be stricken.

**~~4VAC15-30-10. Possession, importation, sale, etc., of wild animals. (REPEAL)~~**

~~Under the authority of §§ 29.1-103 and 29.1-521 of the Code of Virginia it shall be unlawful to take, possess, conduct research, import, cause to be imported, export, cause to be exported, buy, sell, offer for sale, or liberate within the Commonwealth any wild animal unless otherwise specifically permitted by law or regulation. Unless otherwise stated, for the purposes of identifying species regulated by the board, when both the scientific and common names are listed, the scientific reference to genus and species will take precedence over common names.~~

Rationale: Entire section is covered by Code, §29.1-103 sets up authority of the Board, §29.1-521(10) covers this portion of authority, specifically relating to possession and transportation, which drive all of the prohibited activities outlined in the stricken regulatory language. §29.1-521(11) address sale of wild animals and parts.

**4VAC15-30-40. Importation requirements, possession, and sale of nonnative (exotic) animals.**

**[ONLY AFFECTED LANGUAGE DISPLAYED FOR DOCUMENT LENGTH CONSIDERATIONS]**

~~F. Exception for snakehead fish. Anglers may legally harvest snakehead fish of the family Channidae, provided that they immediately kill such fish and that they notify the department, as soon as practicable, of such actions. (NOTE: blue highlight is a reg reduction already approved in May 2025 and will be effective on 9/1; yellow is a new change)~~

Rationale: Subsection F was amended by the DWR Board in May of this year to strike the mandatory reporting mandate. This change will become effective (law) on 9/1/2025. However, further review of this section reveals that the whole subsection F is unnecessary as it duplicates §29.1-574(B).

#### **4VAC15-35-80. Permit procedures.**

A. ~~Required general information.~~ A permit application must ~~contain the following information:~~ be completed and submitted to the department.

~~1. Applicant's full name and address, telephone number, and, if available, fax number and email address;~~

~~a. If the applicant resides or is located outside of the Commonwealth of Virginia, the name and address of an agent located in the Commonwealth of Virginia; and~~

~~b. If the applicant is an entity, a description of the type of entity and the name and title of an individual who will be responsible for the permit;~~

~~2. Location of the regulated activity;~~

~~3. Certification in the following language: "I hereby certify that the information submitted in this application is complete and accurate to the best of my knowledge and belief";~~

~~4. Desired effective date of the permit except where issuance date is fixed by the sector-specific plan under which the permit is issued;~~

~~5. Desired duration of the permit, if less than the default term for the sector-specific plan under which the general or individual incidental take permit is requested;~~

~~6. Date of application;~~

~~7. Signature or electronic signature of the applicant; and~~

~~8. Such other information or documentation as may be required by the applicable sector-specific plan.~~

B. Administrative procedures.

1. The department shall determine the completeness of an application and shall notify the applicant of any determination within 45 calendar days of receipt. Where available to the applicant, electronic communication may be considered communication in writing.

a. If, within those 45 calendar days, the application is deemed to be incomplete, the applicant shall be notified in writing of the reasons the application is deemed incomplete. If the application is resubmitted, all deadlines in this section shall apply from the date of receipt of the resubmitted application.

b. If a determination of completeness is made and the associated sector-specific plan does not require additional department review, the application is deemed approved and the applicant will be notified in writing.

c. If a determination of completeness is not made and communicated to the applicant within 45 calendar days of receipt, the application shall be deemed complete on the 46th day after receipt.

d. If the application is complete and the associated sector-specific plan requires additional department review, the department will take no more than 120 days to review. Bundled projects subject to prior approval of biennial standards and specifications as described in [4VAC15-35-90](#) may take up to 180 days. If, at the end of the designated review period, the department has not taken final action on the application or notified the applicant in writing of the need for an additional 60 days for review, the application shall be deemed approved.

2. During the review period, the application shall be approved or disapproved, and the decision communicated in writing to the applicant. If the application is not approved, the reasons for not approving the application shall be provided in writing. Approval or denial shall be based on the application's compliance with the requirements of this chapter and the applicable sector-specific plan.

a. If the application is not approved, the applicant shall have 45 calendar days to revise the permit application to bring it into compliance with the appropriate sector-specific plan or to appeal the decision to the director of the department under the department's dispute resolution and administrative appeals procedure. The applicant may request, in writing, an extension of the timeframe in which to submit a revised application, not to exceed an additional 60 calendar days. If the revised application is not submitted within the defined timeframe, the department will administratively close the application.

b. Upon submission of a revised application after denial, the department shall have 120 days to review and make a determination. If the application is denied again, the applicant will have 45 days after denial to appeal the decision to the director of the department under the department's dispute resolution and administrative appeal procedure. Any new revisions to the permit must be submitted as a new application.

3. Upon approval of an application for an individual incidental take permit, the department will provide the applicant with a permit, including terms and conditions. The applicant shall have 30 calendar days to appeal terms and conditions to the department director under the department's dispute resolution and administrative appeals procedures.

C. Permit issuance.

1. Denial. The department shall not issue a permit if:

- a. The applicant has one or more of the disqualifying factors included in subdivision 2 of this subsection;
- b. The applicant has failed to disclose material information or has made false statements as to any material fact in connection with the application; or
- c. The department determines that the application fails to comply with the applicable sector-specific plan or any other applicable wildlife law, regulation, or ordinance.

2. Disqualifying factors. The department will provide written notice of any known disqualifying factors to the applicant. Any one of the following will disqualify an applicant from receiving or exercising a permit:

- a. A conviction of, or entry of a plea of guilty or nolo contendere by, the applicant or a representative of the applicant for a violation of the Lacey Act (16 USC § 3371 et seq.); the federal Migratory Bird Treaty Act (16 USC § 668 et seq.); the federal Bald and Golden Eagle Protection Act (16 USC § 668 et seq.); the federal Endangered Species Act (16 USC § 1531 et seq.); the Virginia Endangered Species Act (§ [29.1-563](#) et seq. of the Code of Virginia); or this chapter within the five-year period preceding the application, unless such disqualification has been expressly waived by the department in response to a request by the applicant.

- b. The failure to pay any required fees.

- c. The suspension of any other incidental take permit. The applicant is disqualified from receiving any additional incidental take permits as long as the suspension exists.

3. Fees. An application fee of \$50 and a permit fee of \$50 per year shall be due for each permit. ~~The application fee shall be due at the time of application submittal, and no~~ No application shall be processed until the fee is received. ~~The full amount of the permit fee shall be based on the default duration of the permit and is due at the time of certification if no approval is required. If the department's approval is required, the full amount of the permit fee is due upon approval or issuance of a permit. The fees will be deposited into the Nongame Cash Fund and used for the conservation and management of regulated bird species consistent with § 58.1-344.3 of the Code of Virginia. No refund of any fees paid shall be made if a permit application is denied or if a permit is terminated prior to the expiration date.~~

4. Permit renewal. Applications for renewal shall meet and comply with all requirements for permit application and be submitted at least 90 calendar days prior to the expiration of an existing permit.

5. Modifications to permits. Permits may be modified with the department's approval in accordance with the following:

a. Applicant's request. Where circumstances have changed so that an applicant desires to have any condition of the permit modified, the applicant must submit a full written justification and supporting information to the department in conformity with the terms and conditions under which the permit was issued.

b. Department determination. The department may amend any permit during its term where circumstances have changed such that amendments to the permit are deemed necessary by the department. In such instances, the department will notify the applicant in writing 60 calendar days in advance of the effective date of any amendment. The applicant shall have 30 calendar days to appeal the decision to the department director under the department's dispute resolution and administrative appeals procedures.

6. Transfer of permits and scope of permit authorization.

~~a. Except as otherwise provided for in this subsection, permits issued under this part are not transferable or assignable.~~

b. Permits may be transferred in whole or in part through a joint submission by the applicant and the proposed transferee, or, in the case of a deceased applicant, the deceased applicant's legal representative and the proposed transferee. The department will review the submission and approve the transfer provided that:

(1) The proposed transferee meets all of the qualifications under this part for holding a permit;

(2) The proposed transferee has provided adequate written assurances that it will implement the relevant terms and conditions of the permit; ~~and~~

~~(3) The proposed transferee has provided other information that the department determines is relevant to the processing of the submission.~~

c. Except as otherwise stated on the face of the permit, any person who is under the direct control of the applicant or who is employed by or under contract to the applicant for purposes authorized by the permit may carry out the activity authorized by the permit. However, the applicant will remain responsible for ensuring compliance with all aspects of the permit.

7. Discontinuance of permit activity. When an applicant discontinues activities authorized by a permit, the applicant shall within 30 calendar days of the discontinuance notify the department of permit termination.

8. Permit inspections. The department shall have the right to perform inspections of a permitted activity to ensure compliance with permit conditions. Written, including electronic, or verbal notice of such inspection shall be given on a business day, and the inspection shall not occur no less than one and no more than five business days from the date of the notice, except when the department determines that an emergency inspection is necessary.

9. Permit suspension and revocation.

a. Criteria for suspension. The privileges of exercising some or all of the permit authority may be suspended at any time if the applicant is not in compliance with the conditions of the permit, the sector-specific plan, or any applicable laws or regulations governing the conduct of the regulated activity. Such suspension shall remain in effect until the department determines that the applicant has corrected the deficiencies.

b. Criteria for revocation. A permit may be revoked for any of the following reasons:

(1) The applicant willfully violates any provision of the Virginia Endangered Species Act (§ [29.1-563](#) et seq. of the Code of Virginia); the federal Migratory Bird Treaty Act (16 USC § 703 et seq.); the federal Bald and Golden Eagle Protection Act (16 USC § 668 et seq.); the federal Endangered Species Act (16 USC § 1531 et seq.); or the conditions or a permit issued under those acts or this chapter; or

(2) The applicant fails within 60 calendar days to correct deficiencies that were the cause of a permit suspension.

c. Procedure for suspension and revocation.

(1) The applicant shall be notified in writing of the suspension or revocation by certified or registered mail. This notice shall identify the permit to be suspended, the reasons for such suspension, and the actions necessary to correct the deficiencies and inform the applicant of the right to appeal the suspension. The department may amend any notice of suspension or revocation at any time.

(2) The applicant shall be provided with an opportunity to appeal the suspension or revocation within 30 calendar days of mailing the suspension or revocation notice. Appeal may be requested by filing a written objection specifying the reasons the applicant objects to the suspension or revocation and may include supporting documentation. Amendment of a notice of suspension or revocation will allow the applicant another 30 calendar days to appeal the decision from the date of mailing notice of the amendment if they have not already initiated an appeal.

(3) If at the end of 30 calendar days no appeal has been received by the department, a final order shall be issued suspending or revoking the permit.

(4) If the applicant timely submits an appeal, an informal fact-finding proceeding will be held within 30 calendar days, or at the option of the department or the applicant, a formal hearing may be scheduled as soon as may be practicable.

(5) Following an informal fact-finding proceeding or formal hearing, a final decision shall be made by the director within 30 calendar days of the informal fact-finding proceeding or receipt of a recommendation by any hearing officer.

**Rationale:** Amendments applied are for regulatory reduction purposes to remove unnecessary requirements and do not change the desired outcomes of the regulation's intent.

**4VAC15-40-200. Restricted use of above ground body-gripping traps in excess of five inches.**

It shall be unlawful to set above the ground any body-gripping trap with a jaw spread in excess of five inches when using any bait, lure, or scent; provided, that baited body gripping traps with a jaw spread up to 7-1/2 inches may be used when the trap is within an enclosure with openings no greater than 60 square inches and the trap trigger is recessed at least 12 inches from all openings; provided further that such traps must be staked to prevent them from turning over and may ~~only be used on private lands with written permission of the landowner.~~ not be used on public lands.

Rationale: The amended language simplifies the regulation by removing two mandates and replacing with one mandate (*not to be used* on public lands).

**4VAC15-40-260. Sunday hunting on controlled shooting areas.**

A. Except as otherwise provided in the sections appearing in this chapter, it shall be lawful to hunt pen-raised game birds seven days a week as provided by § [29.1-514](#) of the Code of Virginia. The length of the hunting season on such preserves and the size of the bag limit shall be in accordance with rules of the board. For the purpose of this chapter, controlled shooting areas shall be defined as licensed shooting preserves.

~~B. It shall be unlawful to hunt pen-raised game birds on Sunday on controlled shooting areas in Augusta County or in any county or city which prohibits Sunday operation by ordinance.~~

Rationale: Sunday hunting is now legal. Any local ordinances a locality places on hunters regarding the use of firearms or time-of-day noise rules are outside the scope of this regulation section.

**4VAC15-40-280. Department-owned, controlled, or managed lands; annual permit for hunting on lands managed by the department.**

A. The open seasons for hunting and trapping, as well as hours, methods of taking, and bag limits for department-owned or department-controlled lands, or lands managed by the department under cooperative agreement, shall conform to the regulations of the board unless excepted by posted rules established by the director or his designee. Such posted rules shall be displayed at each recognized entrance to the land where the posted rules are in effect.

B. Department-owned lands shall be open to the public for wildlife observation and for hunting, fishing, trapping, and boating (as prescribed by [4VAC15-320-100](#)) under the regulations of the board. Other activities deemed appropriate by the director or his designee may be allowed by posted rules, by written authorization from the director or his designee, or by special permit.

C. No person shall hunt on lands managed by the department through a lease agreement or other similar memorandum of agreement where the department issues an annual hunting

permit without having purchased a valid annual hunting permit. The ~~annual hunting permit shall be in addition to the required licenses to hunt, and the~~ cost of such permit shall be the same as the cost of the annual state resident hunting license in § 29.1-303 of the Code of Virginia.

D. Activities that are not generally or specifically authorized in accordance with subsections A through C of this section are prohibited and shall constitute a violation of this regulation.

Rationale: Stricken language in subsection C is unnecessary. Hunters who utilize Public Access Lands for Sportsmen (PALS) need to obtain such permit to do so in addition to having their other annual or lifetime hunting licenses and big game tags; remaining language reflects this requirement.

#### **4VAC15-90-280. Sale of cervid parts and cervid mounts.**

~~Provided that no extraneous muscle tissue is attached, it~~ It shall be lawful to purchase or sell the hair, hide, tail, sinew, skull, antlers, bones, and feet of a legally possessed cervid carcass or cervid carcass part, any products made from these deer parts, and cervid mounts.

Rationale: Regulatory language is unnecessary and implied in that muscle tissue is not listed as a lawful part for purchase or sale.

#### **4VAC15-200-60. Disposal of wild rabbit parts.**

~~No wild rabbit carcasses or carcass parts may be discarded or disposed of directly on the ground.~~ All ~~such~~ wild rabbit carcasses or carcass parts must be buried at least two feet below ground, incinerated, or securely bagged and discarded in household trash for ultimate disposal in a permitted landfill.

Rationale: Amendments simplify regulation by using one mandate instead of two.

#### **4VAC15-275-10. Application.**

This chapter applies to any person who has never obtained a license to hunt in any state or country or any person who is younger than 16 years of age, unless such a person presents to the Department of Wildlife Resources or one of its authorized license vendors a certificate proof of completion in hunter education issued or authorized by the director or the director's representative under the hunter education program or proof that he holds the equivalent certificate obtained from an authorized agency or association of another state or country.

Rationale: The word “proof” is proposed to be added to allow flexibility for those who can show proof of completion rather than needing to show the actual certificate itself. This tracks with our move to online records keeping within a customer’s Go Outdoors account.

#### **4VAC15-275-20. Definitions.**

The following words and terms when used in this chapter shall have the following meanings

unless the context clearly requires a different meaning:

"Accompanied and directly supervised" means, in the case of an apprentice hunter, that a licensed person older than 18 years of age maintains a close visual and verbal contact with, provides adequate direction to, and can immediately assume control of the firearm from the apprentice hunter. In the case of a hunter 12 years of age or younger, the term means that the licensed adult is within sight of the person the age of younger than 12 years of age.

"Adult" means the parent or legal guardian of the person age younger than 12 years of age, or such person the age of older than 18 years of age designated by the parent or legal guardian.

"Approved course provider" is any individual, business, or organization that makes available to the hunting public a hunter education course that is approved by the International Hunter Education Association – United States (IHEA-USA) and is accepted by the department. An approved course provider shall have executed and have on file a valid cooperative agreement with the department. The department will make information regarding such approved courses and providers readily available for public access.

"Board" means the Board of Wildlife Resources.

"Department" means the Department of Wildlife Resources.

"Hunter education course" means a course offered in the classroom, through the Internet, or through an electronic format that provides course content and test questions that at a minimum meet the International Hunter Education Association-USA Education Standards, ~~May 2, 2014,~~ set forth by the International Hunter Education Association-USA (IHEA-USA) and are accepted by the department. ~~A hunter education course shall include no less than 50 test questions, which shall include at least eight test questions specific to Virginia hunting laws.~~

"IHEA-USA" means the International Hunter Education Association-USA.

"Virginia Hunter Education Card" means a card authorized for issuance by the department to a person who has met the minimum standard of hunter education course competency. This card may be issued as an original or a replacement hunter education course card.

Rationale: The International Hunter Education Association – USA Standards have been updated in 2024, with tentative plans to update bi-annually. By removing the May 2, 2014 date, we are able to maintain current standards without regard to the obsolete date of 2014. Removing “A hunter education course shall include no less than 50 test questions, which shall include at least eight test questions specific to Virginia hunting laws” allows us to follow IHEA-USA Standards should they deviate from the 2014 Standard of a minimum of 50 test questions.

**4VAC15-275-30. Provisions for compliance and minimum standards for hunter education course competency.**

A. A person shall be considered in compliance with the requirements for hunter education if

he meets one or more of the following provisions pursuant to § [29.1-300.2](#) of the Code of Virginia:

1. Completes and passes a hunter education course that is accepted by the department including a fully online course;
2. Is 16 years of age or older and has previously held a license to hunt in any state or country;
3. Is under the age of 12 years and is accompanied and directly supervised by an adult who holds a valid Virginia hunting license; or
4. Holds a Virginia apprentice hunting license and is accompanied and directly supervised by a licensed adult hunter.

B. The minimum standards for hunter education course competency required by the department are: a passing score of 80% on a closed-book written test upon completion of an in-person classrooms course or a passing score of 90% on a self-administered test in conjunction with the course material of a hunting safety education course delivered through the internet.

~~1. Successful completion of a classroom-based hunter education course or through another format as determined by the department with a passing score of at least 80% on a written test administered closed book at the conclusion of the course by the designated course instructor or other designated course assistant as determined appropriate by the department; and~~

~~2. Successful completion of an Internet hunter education course that is approved by the department with a passing score of at least 90% on an open-book test administered during the online course.~~

Rationale: Cleaned up language and streamlined content. This change does not alter the content, only the expression of the content.

#### **4VAC15-275-40. Hunter education course provider requirements.**

~~A. To be an approved course provider, any individual, business, or organization that instructs or provides a hunter education course shall execute and have on file a cooperative agreement with the department. It shall be the responsibility of the state hunter education program manager or his designee to develop and execute such agreements. A list of approved course providers and hunter education courses shall be kept by the department and made available to the public. Such list does not constitute any endorsement of any course or course provider by the department or the board.~~

B. As of January 1, 2016, any hunter education courses offered through the Internet and accepted by the department shall:

1. Meet the International Hunter Education Association-USA Education Standards, ~~May 2, 2014,~~ set by the IHEA-USA for course content; and

2. Be provided only by an approved course provider that has executed a valid cooperative agreement with the department. Such agreements may be amended at any time by the department and may be canceled with 30 days notice upon failure of the course provider to comply with the terms and conditions of the agreement or its amendments.

C. Any material or product to be used by an approved course provider that makes reference to the department must be approved by the department through the hunter education program manager or his designee before being published or distributed to the public.

D. Any fees charged by a course provider are set by the course provider, but must be clearly communicated to the student prior to the student taking the course. ~~There will be no fees for Virginia hunter education courses provided by the department.~~

Rationale: Section A is redundant and is covered by DWR Hunter Education Program Policy as well as IHEA-USA Standards. Item B, inserting “and” broadens scope to be more inclusive of all Hunter Education programs. Item B.1. removes the obsolete date of a previous IHEA-USA Standards date of issue. Item D is redundant and covered by DWR Policy.

**4VAC15-275-60. Hunter education course certificates, record keeping, and student records.**

A. Upon successful completion of an online hunter education course, the approved course provider shall provide the student with a course certificate or wallet-size card. At a minimum, such certificate or card shall include the student's name and date of birth, the issuance date, the name of the course, and an indication of acceptance by the department. ~~On a schedule and in a manner mutually agreed to through a cooperative agreement, each approved online course provider shall provide to the department a copy of the record of those students issued a course certificate or wallet-size card. Upon request by the student and subject to verification of successful course completion, it shall be the responsibility of each approved online course provider to issue a duplicate certificate or card.~~

B. Upon successful completion of the Virginia hunter education classroom-based course, the department shall issue a completion certificate or card, which shall include the person's name, ~~date of birth,~~ and the issuance date. Upon request by the person to whom the certificate or card was originally issued and subject to verification of successful completion, the department shall issue a duplicate certificate or card in accordance with its policy.

C. The department shall maintain a database of all students successfully completing the department's classroom-based or online hunter education course. Such database shall include, but not be limited to, student name, address, date of birth, course or other compliance format approved by the department, and the specific name of the course.

D. Each approved course provider for hunter education courses offered over the Internet or through an electronic format shall maintain a database of all students successfully completing such course. The database shall include, but not be limited to, student name, address, date of birth, course completion date, and the specific name of the course.

Rationale: Streamlines and combines sections 4VAC15-275-60 with 4VAC15-275-70.

**~~4VAC15-275-70. Recordkeeping and student records. ( REPEAL)~~**

- ~~A. The department shall maintain a database of all students successfully completing the department's classroom based or online hunter education course. Such database shall include, but not be limited to, student name, address, date of birth, course or other compliance format approved by the department, and the specific name of the course.~~
- ~~B. Each approved course provider for hunter education courses offered over the Internet or through an electronic format shall maintain a database of all students successfully completing such course. The database shall include, but not be limited to, student name, address, date of birth, course completion date, and the specific name of the course. On a schedule and in a manner mutually agreed to through a cooperative agreement, each approved course provider shall provide to the department a copy of the record of those students who successfully complete its course. Such record shall include the database information referenced in this section. It shall be the responsibility of each approved course provider to ensure that reasonable measures, such as the Payment Card Industry (PCI) data security measures, are taken to protect any acquired student data. Further, such data shall not be sold or otherwise used in any way except for the student's own completion of a hunter education course and issuance of course completion documents.~~

Rationale: Streamlines and combines section VAC15-275-70 with 4VAC15-275-60.

**4VAC15-275-80. Instructor certification.**

- A. The department may designate as a hunter instructor any person found by it to be competent to give instruction in the courses required.
- B. Volunteer instructors are designated to work on a voluntary basis and at the pleasure of the Department of Wildlife Resources.
- C. To be certified as a hunter education course instructor for the department's hunter education program, a person shall (i) have successfully completed a hunter education course and (ii) be certified as an instructor by the department or by a certification program accepted by the department.
- D. Applicants for certified instructor shall submit an application to the department on a form and in a manner determined by the hunter education program manager.
- Applicants may be required to submit a written consent for a criminal history background check in a manner determined by the Law Enforcement Division of the department. At a minimum, the application shall include:

- ~~1. The applicant's name;~~
- ~~2. The applicant's street address;~~
- ~~3. The applicant's telephone number;~~
- ~~4. The applicant's email address, if any;~~
- ~~5. Information describing the applicant's experience and training in hunter and hunting and proof of completion of a hunter education course that is accepted by the department; and~~
- ~~6. Any other information deemed necessary after review of the initial application.~~

~~E. Applicants may be required to submit written consent for a criminal history background check in a manner determined by the department or an interview in a manner determined by the department and in accordance with state policy.~~

Rationale: Simplifies the process which is covered by DWR Volunteer Policy.

#### **~~4VAC15-275-90. Virginia Hunter Education Card. (REPEAL)~~**

- ~~A. The department may issue an optional long-lasting and durable Virginia Hunter Education Card to persons who can show that they have met the minimum standard of hunter education course competency pursuant to § 29.1-300.2 of the Code of Virginia.~~
- ~~B. Upon receipt by the applicant, the optional Virginia Hunter Education Card will serve in lieu of any other certificates or cards that have been issued to the bearer as a result of meeting the minimum standards for hunter education course competency. As such, the Virginia Hunter Education Card will not be transferable or revocable and will have no expiration date.~~
- ~~C. A person may apply for a replacement Virginia Hunter Education Card. A replacement card may be issued if (i) the original card is lost, stolen, or destroyed; (ii) misinformation is printed on the card; or (iii) if the bearer has legally changed his name. Supporting documentation may be required.~~

Rationale: Covered by DWR Hunter Education Policy.

#### **~~4VAC15-275-100. Fees. (REPEAL)~~**

- ~~A. Pursuant to § 29.1-300.3 of the Code of Virginia, no fee shall be charged for the instructor's service.~~
- ~~B. Fees charged by an approved online course provider for hunter education courses other than the department's course are set by the course provider, but must be clearly communicated to the student prior to the student taking the course.~~
- ~~C. The fee for issuance of an optional Virginia Hunter Education Card, which will serve in lieu of a previously obtained hunter education course certificate or card, or a replacement Virginia Hunter Education Card shall be \$10.~~

Rationale: Covered by DWR Hunter Education Policy.

#### **4VAC15-290-80. Stuffing or mounting birds and animals – records; inspections.**

A. A holder of a permit to stuff or mount birds and animals shall keep a complete record of all transactions ~~as required by the permit. Such records shall include the species to be mounted or tanned; the date of receipt; the name, address and telephone number of the person for whom the work is being performed; the name of the person who killed the specimen (if different from above); the hunting license or Virginia driving license number of such person; the county where the specimen was taken or, if taken out of state, the state in which it was taken; and the date the completed work was returned to the customer. Such records shall be retained for three years. These records, and the premises where such business is conducted, shall be open to inspection by representatives of the department during normal business hours.~~

B. ~~Upon receipt of any specimen of wildlife, a~~ A holder of a permit shall ~~immediately~~ affix to such specimen a tag bearing the designation of the species, the name and address of the customer and the date the specimen was killed. ~~Such tag shall remain affixed to the specimen, except when the specimen is actually in the process of being worked on, until it is delivered to the customer.~~ A numbered tag, with numbers corresponding to the number of the line entry of the records required in subsection A of this section, may be used in lieu of that.

Rationale: Amendments applied in order to reduce regulatory burden of unnecessary language without changing the ultimate regulatory outcomes.

#### **4VAC15-290-140. Possession and display of a harvest information program authorization to hunt migratory game birds.**

Every person, whether licensed or exempt from being licensed, ~~(i)~~ must be registered with the Virginia Harvest Information Program (HIP) to hunt migratory game birds, including waterfowl, doves, woodcock, snipe, rails, gallinules, moorhens, and coots; ~~(ii) must carry the HIP authorization on his person when hunting; and (iii) shall present it immediately upon demand of any officer whose duty it is to enforce the game and inland fish laws.~~ The penalty for violation of this section is prescribed by § 29.1-505 of the Code of Virginia.

Rationale: Amendments applied in order to reduce regulatory burden of unnecessary language without changing the ultimate regulatory outcomes. Hunters now have their HIP numbers and proof of purchase in the online Go Outdoors Virginia account, and Conservation Police can look these up remotely.

#### **4VAC15-330-180. Bills of sale for trout creel in commercially operated fishing ponds.**

The operator of a commercially operated fishing pond shall be required to furnish each fisherman taking trout therein a ~~bill of sale, which shall include the name of the fisherman, date, species and number of trout creel.~~ receipt. The fisherman shall retain this ~~bill of sale~~

receipt as long as the fish are in his possession ~~and a duplicate of that shall remain with the operator of the commercially operated fishing pond and be made available for inspection by all authorized department personnel.~~

Rationale: Regulatory simplification per Executive Order 19, reduces two mandates while still maintaining the integrity of the regulatory section.

#### **4VAC15-330-190. Trout artificially raised for sale.**

A. Permit required. It shall be lawful to sell artificially raised brown trout, brook trout or rainbow trout. Commercial aquaculture operations in Virginia that artificially raise and sell brown, brook, and rainbow trout must obtain a permit from the department.

~~B. Records. Any person who shall artificially raise brown trout, brook trout or rainbow trout for sale shall keep a record of the number and species, the number raised or, if imported, from whom purchased.~~

~~C. Inspection of premises or establishments. Any establishment raising trout or ordering, importing or possessing trout, as provided for in subsection A of this section, shall be open to inspection at all reasonable hours to any representative of the department.~~

D. Trout as bait. Artificially raised rainbow trout may be sold as bait for use in the James River and the New River, and in impoundments (ponds, lakes, and reservoirs), except impoundments listed as designated stocked trout waters, Lake Moomaw, and Philpott Reservoir. Persons possessing purchased rainbow trout for bait must have a valid invoice or bill of sale, specifying date of purchase, the number of trout purchased, and name of an individual or business permitted to sell trout.

Rationale: Records are kept per permit issuance terms to artificially raise trout, so not needed in regulatory language. Same with notice of inspections; is outlined upon issuance of trout aquaculture operations.

#### **4VAC15-340-20. Haul seines to take fish for personal use.**

A. Authorization to take fish for personal use. Pursuant to §§ 29.1-412 and 29.1-416 of the Code of Virginia, a permit to use a haul seine to take fish for personal use authorizes the holder of such permit to take nongame fish (except for those species listed in 4VAC15-20-130) with a haul seine for private table use, but not for sale in the counties of Franklin, Henry and Patrick, and in those waters as specified in § 29.1-531 of the Code of Virginia in the county for which such permit is issued, except as otherwise prohibited in 4VAC15-320-100, 4VAC15-330-60, 4VAC15-330-20 (Repealed), and in waters listed in subsection F of this chapter.

B. Holder to be present when seine operated. The holder of a permit to take fish with a haul seine for personal use must be present when the seine is being operated but may have other persons to assist him who are not required to have a permit. However, those assisting the

permittee or handling live fish or both must meet the fishing license requirements of the Commonwealth.

C. Length and size of haul seines. The length of a haul seine to take fish for personal use shall not be more than 60 feet in length. The minimum size of mesh shall be 1-½-inch bar mesh (3-inch stretch mesh).

D. Season to take fish with a haul seine. The season to take fish with a haul seine for personal use shall be from July 1 through September 30, both dates inclusive.

~~E. Department notification required to use a haul seine. Persons permitted to use a haul seine for personal use must notify the regional law enforcement office a minimum of 48 hours prior to use.~~

F. Haul seine use restricted in certain areas. The use of haul seines for personal use is prohibited in the following stream sections of Franklin and Patrick counties:

#### FRANKLIN COUNTY

Roanoke River from County Route 634 crossing upstream to the Roanoke/Franklin County line.

#### PATRICK COUNTY

Smith River from Philpott Lake upstream including headwaters.

Rock Castle Creek from its confluence with Smith River upstream, including headwaters.

Dan River from VA/NC state line upstream to County Route 631 crossing.

Poorhouse Creek from its confluence with North Fork Mayo River upstream including headwaters.

North Fork Mayo River from its confluence with Poorhouse Creek upstream.

Rationale: No other gear requires notification of law enforcement officer. Further, very few personal haul seine permits are issued in a given year. None were issued in 2025.

#### **4VAC15-340-40. Dip nets; generally.**

A. Authorization to take fish with dip nets. A county dip net permit shall authorize the holder to take shad, herring, mullet, and suckers (daily creel (possession) limits for shad and herring are found in 4VAC15-320-25, there is no limit for mullet, and subsection D of this section provides limits for suckers), in the county named on the face of the permit with a dip net in inland waters, except where otherwise prohibited by local legislation or by the sections appearing in this chapter.

B. Persons required to have permit; inspection by conservation police officers. A dip net permit, or valid fishing license, shall be required for all persons using or assisting in the use of a dip net

and permits, or licenses, shall be carried at all times while using such nets ~~and shall be subject to inspection by conservation police officers.~~

C. Release of certain fish netted. All fish, except shad, herring, mullet, suckers and carp, when taken with a dip net shall be returned to the water alive with as little injury as possible.

D. Special provisions applicable only to suckers. The following special provisions shall apply only to the taking of suckers, with a dip net:

1. Not more than 20 may be taken by any person in one day;
2. The open season for taking same with a dip net shall be from February 15 through May 15, both dates inclusive; and
3. Dip nets for taking such fish shall not be more than six feet square.

Rationale: Removes unnecessary language from subsection B. Conservation Police Officers do not need this regulatory permission to inspect fishing tackle.

#### **4VAC15-360-20. Taking minnows and chubs for sale.**

~~A. "Haul seine," as used in this section, when used in the inland waters of the Commonwealth above where the tide ebbs and flows shall mean a haul seine not exceeding four feet in depth by 15 feet in length and when used in the public inland waters below where the tide ebbs and flows shall mean a haul seine not exceeding four feet in depth by 100 feet in length. Such a term shall be construed also to include umbrella type nets without limit as to size and also small minnow traps with throat openings no larger than one inch in diameter.~~

B. It shall be unlawful to take minnows and chubs (Cyprinidae) for sale from the inland waters of the Commonwealth.

C. Commercial bait operations must have a Permit to Hold or Sell Certain Wildlife or a Permit to Propagate and Sell Certain Wildlife. With the exception of those species listed in 4VAC15-20-130, these operations may possess and sell unlimited quantities of minnows and chubs (Cyprinidae), when possession is accompanied by a valid invoice or bill of sale from an individual permitted under subsection B of this section or from a properly permitted aquaculture facility in Virginia or out-of-state.

Rationale: Since taking of minnows and chubs for sale is not allowed, there is no need to define a gear type or restrictions on that gear.



**VIRGINIA DEPARTMENT OF WILDLIFE RESOURCES**

**2025-2029 BLACK BEAR MANGE MANAGEMENT PLAN**

## ACKNOWLEDGEMENTS

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**John Tracey, DVM**

**Nelson Lafon, MS**

**Katie Martin, MS**

**Carl Tugend, MS**

**Cale Godfrey, MS**

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Jon Cooper; VDWR Board Member

North Carolina Wildlife Resources Commission; Internal Bear Mange Committee lead by

Colleen Olfenbutt, MS and Miranda Turner, MS

Scott Carver, PhD; University of Georgia

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## Executive Summary

Mange, a highly contagious skin disease caused by mites, affects many wild and domestic mammals. Sarcoptic mange caused by *Sarcoptes scabiei* is implicated most often in Virginia's bears. From 2014 to 2018, sporadic reports of bear mange in Virginia were primarily focused in the northern Shenandoah Valley (close to known distributions in West Virginia, Maryland, and Pennsylvania). Since 2020, reports have increased in frequency and geographic spread, with 27 counties having at least 3 cases and 33 counties having at least one case. There are many unknowns related to the occurrence and spread of mange in bears. Clinical signs can include itching, hair loss, thickened and dry skin, altered behavior, and poor body condition in severe cases. Research and experience has shown that many bears with mild to moderate cases can survive and clear symptoms of mange. There has been no clear evidence from other states with longer histories with sarcoptic mange that the disease limits bear populations over the long-term. However, localized population declines have been observed recently in some mange-affected areas of Virginia, particularly in counties with historically liberal harvest seasons.

With a primary goal of long-term population viability, Virginia Department of Wildlife Resources (VDWR) recognizes that it must utilize an adaptive management framework to address the imperfect knowledge about mange in bears. Informed by the 2023-2032 Virginia Bear Management Plan, goals for the management of bear mange in Virginia include:

- 1) implementing science-based surveillance and management techniques,
- 2) managing for resilient populations of black bears affected by sarcoptic mange,
- 3) identifying and addressing critical knowledge gaps, and
- 4) communicating effectively with constituents and fostering citizen science opportunities.

This management plan is structured around these four goals. Objectives developed to guide the attainment of each goal are followed by potential strategies that clarify approaches or actions that can be taken.

### Surveillance and Monitoring

To date, the majority of VDWR's surveillance for sarcoptic mange has been from opportunistic investigations of bears with suspicious clinical signs reported by members of the public or hunting communities. Strategies going forward will continue to leverage public reports and citizen science to track the status of the disease, both in bears and wild canids. More active (and costly) surveillance methods are required to answer important epidemiological questions like prevalence/incidence rates of disease, impacts to

populations, and changing host: parasite dynamics. This plan includes objectives and strategies to address:

- standard data collection and response protocols,
- comprehensive statewide surveillance for mange in bears, and
- surveillance for mange in other wildlife species.

### Management & Response

Control measures that are both cost-effective and likely to be helpful should be evaluated and implemented, but it is important to acknowledge that no “silver bullets” currently exist. Eradication of mange in free-ranging species with robust populations has not been successful and is not a practical, cost-effective goal. This plan includes objectives and strategies to address:

- removal of severely infested bears,
- transmission of mange, and
- bear population management in the face of mange.

### Research

For over a decade, VDWR has participated in research efforts within Virginia and across multiple other affected states to better understand mange in bears. This plan includes objectives and strategies to address future research opportunities, limitations, and hurdles.

### Communication & Outreach

Since 2014, when the current sarcoptic mange outbreak in bears began in Virginia, a central component of VDWR’s efforts related to mange has been outreach and communication with the general public, interested hunters and landowners, and external partners and agencies within Virginia and regionally. This plan includes objectives and strategies to address:

- public awareness of mange,
- engagement of constituents in surveillance and management, and
- inter- and intra-agency understanding of mange.

## Introduction

Mange is a highly contagious skin disease caused by microscopic mites affecting many wild and domestic mammals. At least four different mite species have been reported in bears (see Appendix 2); however, sarcoptic mange caused by the skin-burrowing mite *Sarcoptes scabiei* causes the most clinical disease in Virginia. This widespread mite species causes sarcoptic mange in a variety of mammalian hosts, including scabies in humans, and several host-adapted variants (e.g. canis, hominis, suis, etc.) are thought to exist. To date, current evidence from Virginia suggests that the mite and the host species (bears, wild canids) are genetically the same as those in other states in the region, including West Virginia, Maryland, and Pennsylvania. In the 1990's, sarcoptic mange emerged as a significant concern for bears in Pennsylvania and has radiated outward to other contiguous bear populations. From 2014 to 2018, sporadic cases of sarcoptic mange began to show up in the several of Virginia's northwestern mountain counties. Since 2020, reports have greatly increased in frequency and geographic spread, with at least 33 counties now with at least one case.

Currently, there are many unknowns related to the presence and spread of mange in bears, and research efforts are underway to understand these processes. Mites are easily transferred to a new host when an unaffected animal comes into direct physical contact with an infested individual. In addition, mites that fall off an infested host can persist in the environment under ideal conditions for up to two weeks and may infect a new animal that enters a contaminated site. Because bears are relatively solitary, the biggest risk for indirect environmental transmission likely occurs under conditions where they congregate, either naturally (e.g. dens, mating, scent-marking) or unnaturally (e.g. garbage cans, bait piles, bird feeders, and other food resources).

The clinical signs of mange are a result of damage to the host's skin by the burrowing mite, the immune reaction of the host, the physical skin trauma that occurs through scratching, and the secondary bacterial infections that subsequently develop. Clinical signs are variable but can include intense itching, mild to severe hair loss, thickened or dry skin covered by scabs or tan crusts, altered behavior (e.g. lethargy) and poor body condition in severe cases. Research primarily done in Pennsylvania has shown that many bears with mild to moderate cases survive and clear symptoms of mange (Tiffin et al 2024). Bears exhibiting signs of a late-stage mange infestation are often very noticeable to the public due to their poor skin and body condition, their inability to find sufficient resources (food or shelter) in their natural environments, and their propensity to inhabit residential areas or man-made structures.

Although mange is a cause of mortality in black bears, there has been no clear evidence from other states with longer histories of mange in bears that the disease limits populations over the long-term (personal conversations with bear and health teams in PA & WV). However, localized population declines have been observed recently in some mange-affected areas of Virginia, particularly in counties with historically liberal harvest seasons. A multitude of factors including increased harvest seasons to achieve publicly-desired population reductions, successive years of poor hard mast production (primarily red and white oaks), and increased winter temperatures, along with the expansion of mange in bears, have likely all contributed to declining trends in several of Virginia's bear management zones. Research projects with Virginia Tech are currently being conducted to provide information on survival, movements, transmission routes, and potential susceptibility of certain bear populations in Virginia.

VDWR takes sarcoptic mange seriously and is concerned about potential population-level impacts as well as individual bear welfare. For unknown reasons, mange appears to be demonstrating higher case rates and faster spread in Virginia than in some other states despite apparent similarities with regards to hosts, mites, and other disease dynamics. Long-term prospects are for the disease to likely remain endemic in areas already affected and for continued geographic expansion.

With a primary goal of long-term population viability, VDWR recognizes that it must manage this disease to the best of its abilities despite incomplete knowledge of disease processes, extrapolating from existing knowledge about bear biology and sarcoptic mange epidemiology in other species. VDWR is incorporating an adaptive management framework into its approach to wildlife disease management (including mange in bears and chronic wasting disease in deer) which facilitates learning from prior management decisions and allows flexibility to change disease management strategies based upon effectiveness,, emergence of new information, and public acceptance. Using an adaptive management framework, future bear management decisions may be influenced by new and ongoing research aimed at demonstrating how mange spreads on the landscape and evaluating the effectiveness of mange management actions in Virginia and elsewhere.

## **Goals**

The 2023-2032 Virginia Bear Management Plan contains direction regarding surveillance and management of mange and other diseases in bears that informed the development of this mange management plan. The Population Viability goal includes objectives and strategies related to determining and addressing risk factors to long-term bear population

viability. The Population and Carrying Capacity goal in the bear plan includes objectives and strategies for assessing and meeting bear population objectives in each zone across the state. The Bear Health and Welfare goal includes objectives and strategies for monitoring of diseases to determine impacts on the health and welfare of individual bears and on bear populations; implementing applicable management actions to reduce impacts of disease on bear health and populations; and, increasing public awareness regarding bear diseases that may impact the health of bears, humans, and/or other wild or domestic animals.

The goals of the VDWR, as they pertain to management of mange in bears, are as follows:

- i. Implement science-based surveillance and management techniques and continually adapt as more is learned.
- ii. Manage for resilient populations of black bears affected by sarcoptic mange to ensure sustained use and conservation of the resource.
- iii. Identify critical knowledge gaps and address them through professional networks and research efforts.
- iv. Communicate broadly and effectively with constituents and foster citizen science opportunities.

## **Section 1: Surveillance and Monitoring**

### Overview

Surveillance programs for wildlife diseases can utilize passive (opportunistic) or active (systematic) strategies (Mörner et al 2002, Artois et al 2009). To date, the majority of VDWR's surveillance for sarcoptic mange has been from the opportunistic investigations of suspect bears reported by members of the public or hunting communities. These reports are invaluable for tracking the general progression and trends of the disease, but are skewed by numerous factors, including the visibility of certain bears or their proximity to humans, variable human population densities, time of year, and even the willingness of the public to report to VDWR. Active surveillance methods are required to answer important epidemiological questions like prevalence/incidence rates, impacts to populations, and changing host:parasite dynamics. But due to the high costs and logistical hurdles of many active methods, they are infrequently employed over large geographic areas or long time periods. Going forward, a robust surveillance program for sarcoptic mange in bears and other affected hosts in Virginia will require integrating passive and active surveillance approaches that form a comprehensive, statewide mange reporting network, supplemented by targeted, short-term projects designed to answer specific questions, and longer-term, intensive monitoring of certain populations or metrics.

Objective 1: Standardize and objectify mange data collection and response protocols.

*Strategy 1: Develop and implement a case severity grading system based on recognizable clinical signs.*

Clinical signs of sarcoptic mange include alopecia, hyperkeratosis, erythema, and intense pruritus. These are often first noted on the head and face but can begin anywhere on the body. The skin then becomes thickened, fissured, and lichenified, providing opportunity for secondary bacterial and yeast infections. Immune system hypersensitivity responses to antigens in the mites and their by-products are likely responsible for the widespread skin pathology. The secondary infections and intense pruritus can then lead to further behavioral changes, thermoregulatory compromise, loss of body condition, and death. Severely affected individuals are often emaciated. (Niedringhaus et al 2019) (Appendix 3)

A case severity definition that can be applied objectively by trained individuals offers an opportunity to standardize case data and responses. Several researchers have created matrix scoring systems to grade case severity in bears based on 1) hair loss, 2) skin condition, and 3) body condition (Tiffin 2022, Francisco et al unpublished). Similarly, since 2014 VDWR has collected data on these variables as well as the behavioral status of suspected mange cases in bears. To standardize case severity of mange affected bears in Virginia and ensure consistent responses, VDWR will develop a scoring system using a combination of these variable as well as time of year. Within the scoring matrix, body condition will carry more weight than the other scoring variables as body condition appears to correlate more strongly with survival than any of the other factors (Tiffin 2022). While data on skin condition will continue to be assessed, determining pathology through photographs or observations from afar can be difficult; thus, skin condition will not be incorporated into a dispatch or euthanasia protocol, but only scored if an animal is handled.

*Strategy 2: Establish consistent individual and geographical case definitions.*

Although clinical signs (especially in severe cases) are highly suggestive of sarcoptic mange (Brewster et al 2013, Valldeperes et al 2019), there are other causes of alopecia and skin disease that can be misdiagnosed as sarcoptic mange (Appendix 3). There are other mite species that can live on bears (Appendix 2) so it is imperative that proper identification be obtained. *Ursicoptes americanus* mites appear to be more prevalent on bears than originally thought and co-infections with *S. scabiei* have been documented

(Broadhurst et al 2025). Definitive diagnosis of sarcoptic mange requires recovering *S.scabiei* mites from the skin of infested animals through skin scraping or skin biopsy procedures, then confirming the species through microscopic identification of characteristic mite morphology or molecularly via polymerase chain reaction (PCR). Mange can also be confirmed through histopathological examination of skin biopsies by a veterinary pathologist, but mite speciation may not always be possible with this method (Peltier et al 2018). Although microscopic examination is relatively quick and inexpensive, it requires training to perform correctly. Thus, only confident, trained VDWR staff or referral laboratories will be used to “confirm” a suspected case.

Utilizing the clinical signs and diagnostic procedures described above, the following case definitions will be established:

- Sarcoptic mange confirmed
  - Cases will only be considered confirmed if *S. scabiei* mites are verified through microscopic identification by trained individuals, PCR, or histologically.
  - Although subclinical cases of sarcoptic mange have not been witnessed in bears, it is theoretically possible that a case could be confirmed despite no clinical signs.
- Sarcoptic mange suspected, but unconfirmed
  - If quality photographs or game camera images are received that clearly exhibit clinical signs consistent with sarcoptic mange, then the case will be considered suspect.
  - Suspected cases *will be* counted and included in epidemiological and statistical analyses, consistent with previous VDWR case reporting.
- Sarcoptic mange possible
  - This case definition is reserved for reports that could be consistent with mange but exhibit a lack of confidence in the diagnosis. Some examples of possible cases include:
    - Poor quality or long-distance images provided by the public in which clinical signs may be evident but are difficult to discern.
    - A bear exhibiting symptoms that are consistent with numerous causes and no further diagnostics are able to be performed (ex: photos showing mild crusting of the ear tips or mild alopecia).
  - Possible cases *will not* be counted for epidemiological or statistical purposes.

Using confirmed cases, the opportunity exists to study the validity of using photos and observational tools for diagnosis, allowing for further refinement of the case definitions.

Spread of the disease will be tracked at the smallest geographic resolution as possible (ideally GPS location or address) and status of the disease will generally be reported at the county level, using the following designations:

- Mange affected county
  - A county that has had 3 confirmed and/or suspected cases in a single year or 5 confirmed and/or suspected cases in 3 years.
  - This is the designation that VDWR has employed since 2014 and will be retained for consistency purposes.
  - Previous experience has demonstrated that a single mange case in a location far from affected areas does not necessarily “seed” the disease in the bear population (see maps in Appendix 1).
- Mange emerging county
  - A county that is adjacent to a mange affected county *and* has had at least one confirmed or suspected case.
  - These counties are likely to see additional cases in the near future.
- Mange status unknown county
  - A county that does not meet either of the above definitions.
  - This designation would include counties with no confirmed detections as well as counties with single detections that are disjunct from mange effected or emerging counties.

Separating emerging from affected counties allows for varying levels of surveillance or management effort to be applied. As an example, response protocols could focus confirmatory diagnostic tools on emerging and unknown counties. While there are currently no differences in management strategies based on county mange status designations, future protocols might look different in affected vs emerging counties.

*Strategy 3: Refine data collection and database management techniques focused on maintaining a usable, complete, long-term data set.*

Since the emergence of mange in Virginia’s bears, case data has been stored in several spreadsheets and Survey 123 datasets which contain inconsistencies in exactly what was collected and how it is stored. Much of the above discussion in Strategies 1 & 2 seeks to identify what data should be collected, but challenges still exist with how and where to store that data.

In order to accurately categorize and share Virginia's experience with other states and researchers, finding a comprehensive, consistent, long-term mange data solution should be a high priority for VDWR's wildlife health and bear teams.

Objective 2: Perform comprehensive statewide mange surveillance in bears using a combination of active and passive methods.

*Strategy 1: Continue to leverage reports from the public to track the status of the disease.*

As stated above, this technique has been the primary method for tracking disease progression within Virginia and despite inherent biases, is still a valuable surveillance tool.

Reporting mechanisms currently in place include:

- USDA-WS Virginia Wildlife Conflict Helpline (Tollfree, operates M-F, 8AM-4:30PM)
  - This is the primary route from which mange reports are currently received by VDWR. Reports from the Helpline are sent directly via email to the VDWR bear team and the local district wildlife biologist for assessment.
- VDWR Dispatch Center (Operates 24/7, primarily for law enforcement communication)
  - When the dispatch center receives a call for service that references a bear with mange, it is referred to the USDA-WS Helpline, local Conservation Police Officer (CPO), and/or District Wildlife Biologist for the area from which the call was received.
- Email Reporting (Wildlife health, General VDWR, Bear Mange)
  - There are several VDWR email boxes that have been used to report mange including the general VDWR information ([wildlife@dwr.virginia.gov](mailto:wildlife@dwr.virginia.gov)), wildlife health ([wildlifehealth@dwr.virginia.gov](mailto:wildlifehealth@dwr.virginia.gov)), and bear mange reporting ([bearmange@dwr.virginia.gov](mailto:bearmange@dwr.virginia.gov)) email boxes.
  - These mailboxes are monitored by various staff and reports are directed to the appropriate local staff member. Email reporting is not intended for situations involving an emergency response.
  - The Bear Mange mailbox was set up primarily for the reporting of harvested mange bears during an open hunting season but frequently receives general reports of mange affected bears outside of hunting seasons.

Additional reporting Mechanisms in Progress:

- After-hours phone access to a conflict specialist.

- Beginning in the fall of 2025, a human-wildlife conflict specialist will begin duties which include taking after- hours and weekend reports of mange affected bears.
- Calls will continue to be directed to the USDA-WS Virginia Conflict Helpline where a voicemail can be left for the conflict specialist. The conflict specialist will have access to monitor these calls/voicemails during evenings and weekends and provide a response (when needed) for severely mange affected bears.
- Online Reporting Option
  - Expansion of an online disease reporting system interface is in development. This system is part of a broader effort to better capture disease incidents for all wildlife across Virginia.

*Strategy 2: Engage interested constituents in citizen science.*

Fostering engagement from interested constituents can add valuable data and build trust with VDWR. Listed below are some examples of citizen science projects VDWR is currently pursuing or plans to pursue.

- Hunter log and general public observation form
  - A general bear observation form was created and distributed to interested constituencies. This voluntary survey collects date, location (as precise as possible), and number of bears observed. Observations of both healthy bears and mange affected bears can be reported on the observation form.
  - A bear hunter-specific observation form was created and distributed prior to the beginning of the August bear chase season in 2025. This voluntary form asks participants to record bear observations along with hunt metrics such as hunt duration, use of hounds, weaponry, and harvest. Surveys such as these are helpful for gaining hunter effort data along with observations of healthy and mange affected animals.
- Tissue sampling of hunter-harvested bears
  - Annually, over 2,000 black bears are hunter-harvested in Virginia with the most recent 3-year average being 2,630 bears (2022-2024). While physical harvest check stations are no longer operated, hunter participation in sampling efforts for disease surveillance in other species (e.g. white-tailed deer) has remained a valuable tool through both voluntary and mandatory efforts.
  - Biological tissue samples such as muscle, hair, tooth, liver, and blood are all valuable samples that can be readily collected and stored from hunter-

- harvested bears. Additionally, skin scrapes and/or skin biopsies could provide valuable information from both mange affected and non-affected bears.
- Genetic analyses, including landscape-level gene flow, toxin exposure (e.g. rodenticides), mange exposure (antibody presence), and mange mite or other parasite identification are a few of the analyses that could be run from the aforementioned samples. Additionally, sample banking, particularly of bears in current non-mange affected areas, will be critical for future comparisons and analyses. Future funding for genetic or other analytical work will be crucial to continue understanding mange and its impacts on black bears.
  - Consistent metadata (e.g. harvest date and county) are available for hunter-harvested bears and ideally, hunters would willingly provide more specific harvest location information.
  - VDWR staff will collaborate with bear hunters to identify practical sample collection methodologies.

*Strategy 3: Utilize trail camera grid surveys to evaluate disease status and progression.*

Due to the visible nature of mange, trail camera surveys utilizing randomized grids across bear home ranges may be a useful tool for monitoring disease presence and prevalence on the landscape. Camera grids have previously been used for active mange surveillance in other host species (Brewster et al 2017, Ringwaldt et al 2023). Pairing camera arrays with occupancy modeling frameworks (Appendix 7) could allow for the creation of mange detection heat maps, "severity" scoring, and the ability to analyze disease presence with covariates such as habitat (cover types, elevation, aspect), disturbance (distance to roads, human habitation), and site occupancy by other potential mange affected species (e.g. canids).

- Two large camera grids have been deployed as part of a bear spatially explicit mark-recapture population study in collaboration with Virginia Tech (Appendix 5) and images from these grids are currently being evaluated using occupancy modeling. Ideally, at the conclusion of this project, these pre-existing camera grids could be utilized for long-term monitoring and the refinement of statistical methods.
- An ~80 camera grid was deployed in several mange affected (endemic) counties along the northern part of the Blue Ridge in summer 2025. This camera grid will be utilized for a minimum of 2 field seasons (preferably 3) to determine occupancy, habitat use, and detection probability in this area which has demonstrated declining bear population trends in recent years.

*Strategy 4: Continue to trap, collar, and study appropriate bears or mange cases, as funding and staff resources allow.*

- Outside of defined research projects, opportunistic trapping of mange affected bears and monitoring with the use of GPS enabled collars can provide additional survival, movement, and reproductive data that will continue to build on project datasets. Opportunistic trapping events can occur at any time of year (although primarily outside of open hunting seasons due to drug withdrawal periods) affording opportunities to provide additional insight into disease progression and survival.
- Opportunistic trapping/collaring will most likely occur following public reporting of a mange affected bear. Thus, these trapping events may be more likely to occur in developed landscapes with more wildlife-urban interface as compared to existing research trapping efforts currently occurring in more rural settings (e.g. National Forest, Wildlife Management Areas). This will offer additional insights into the potential use of anthropomorphic food sources and developed areas by mange affected bears.
- The use of GPS collars to monitor female bears of reproductive age will be especially important to determine future fecundity rates which directly impact population dynamics. Modern GPS collars typically last 3 to 4 years in the field, allowing for long term monitoring over multiple reproductive cycles.
- Additional research needs are outlined in the research section below and include opportunities for continued monitoring of mange and non-mange affected bears across the state. However, it needs to be recognized that trapping and monitoring of collared bears requires funds and staff resources that will not always be available.

Objective 3: Perform adequate surveillance for mange in other wildlife species.

The early history of mange in North American wildlife is centered around wild canids and is discussed in Appendix 1. Although documentation of the early cases in Virginia's canids is lacking, it has likely existed for over half a century. Currently, red foxes (*Vulpes vulpes*) and coyotes (*Canis latrans*) are the sympatric hosts currently most affected in Virginia (Kelly & Sleeman 2003, VDWR anecdotal data). Other mammalian hosts in Virginia that have published records of sarcoptic mange elsewhere in North America include raccoons, fishers, fox squirrels, house mice, feral swine, porcupines, and white-tailed deer (Niedringhaus et al 2019).

Genetic characterization has revealed that the mites found on both bears and canids in the mid-Atlantic region are genetically similar (Peltier et al 2017, Francisco unpublished). The role other hosts might currently play in the transmission and maintenance of the disease in bears is poorly understood, but despite the disease existing statewide in canids for decades, transmission to bears rarely, if ever occurred. Before the emergence of the sarcoptic mange in Virginia's bears in 2014, the disease was only confirmed in one bear (Appendix 1). More information about the disease in sympatric hosts that overlap with bears is needed to elucidate what role they play in the transmission and maintenance of the disease in bears.

*Strategy 1: Centralize and standardize all potential reports of mange in Virginia's wildlife.*

To track epizootics and spatiotemporal data of mange in wild canids and other wildlife species, VDWR will begin centralizing and standardizing data from public reports of suspected mange events. These reports could be solicited and obtained from the same reporting methodologies as discussed in the bear surveillance section above. VDWR currently receives suspected mange reports from a number of these outlets, but placing an emphasis on the collection of sufficient metadata and centralizing reports will be necessary to allow for review and potential statistical evaluation. Since witnessing mange in wild canids (especially red foxes) has been common for so long, undoubtedly many observations go unreported and constituent outreach will be necessary to encourage reporting.

Additionally, there are numerous partner organizations and constituent groups who interact with wildlife afflicted with mange, including VDWR licensed recreational trappers, VDWR permitted wildlife rehabilitators and nuisance wildlife control operators, USDA-Wildlife Services staff, and county animal control operators. All of these groups could be regularly surveyed to discover regional trends. Larger wildlife rehabilitation facilities often have excellent, databased clinical records that could be regularly filtered and obtained.

*Strategy 2: Leverage trail camera grid surveys to evaluate mange status.*

As discussed above in Objective 2, Strategy 3, standardized camera grids can be used to determine disease status and even estimate prevalence within several host species. Occupancy modeling is currently being performed utilizing images from two Virginia Tech research grids. Research grids for unrelated studies can even provide insight into specific locations and times. For example, photos from a large chronic wasting disease project in

Arkansas have been used to analyze mange in numerous species (Jorge personal communication).

*Strategy 3: Continue to contribute to the genetic and biogeographical understanding of Sarcoptes in North America.*

Researchers with the Southeastern Cooperative Wildlife Disease Study (SCWDS) continue to study the genetic relatedness of mites recovered from numerous host species, and VDWR will continue to collect and contribute specimens to these efforts. To accomplish this, VDWR staff will opportunistically collect skin biopsies or skin scrapes from clinically affected animals and will also work with willing participants from the groups mentioned above for assistance in procuring samples.

## **Section 2: Management and Response**

### Overview

Disease management in wild animal populations utilizes strategies geared towards three basic goals: 1) prevention of disease introduction, 2) control of disease, or 3) eradication of disease (Wobeser 2002). Since *S. scabiei* can infest a large number of mammals over a broad geographic range, several intervention and management strategies have been previously attempted, with varying degrees of success. It is likely this disease will continue to expand within Virginia's bears and regionally throughout contiguous populations, and limiting human assisted movement or acceleration of disease spread will be an important consideration moving forward. Control measures that are both cost-effective and likely to be helpful should be studied and implemented, but it is important to acknowledge that no "silver bullets" currently exist to prevent mange in free-ranging wildlife populations. Further, eradication of mange has not been successful in widespread free-ranging populations and is not a realistic goal. As stated in goal #3 of this plan, VDWR will have to consider effects of this disease as it strives to manage for consistent, resilient bear populations. Given what is currently known, VDWR attempts to respond in such a way that will be more helpful than harmful to bears over the long-term.

Disease prevention, reduction, or management protocols can focus on either the infectious agent (*S. scabiei*), the host (bears and other mammals), or the environment (Virginia's landscapes). Many actions were considered and are described below, even if their implementation is not recommended at this time. It is important for any plan to be adaptive in nature to incorporate new research or results from previous efforts. This is

especially true for mange in bears, where substantial knowledge gaps create a significant need to extrapolate from previously attempted management actions with other species.

Additionally, population impacts of disease can lead to necessary adjustments in species population goals and management approaches. Mange in Virginia's black bears will be a persistent management consideration, but the short and long-term population impacts are still unclear. It is imperative that necessary population data be collected now, so that future population management actions can be appropriately modeled, followed, and reviewed.

Objective 1: Implement appropriate, welfare focused interventional strategies.

*Strategy 1: Continue to opportunistically humanely dispatch or euthanize emaciated bears suffering from mange.*

The reason for euthanizing emaciated, severely affected bears is two-fold. First, although natural recovery is possible for these individuals, bears exhibiting an advanced state of disease in poor body condition are less likely to recover (Tiffin 2022, Tiffin et al 2024). Second, these bears are often highly visible to the public and present justified animal welfare concerns. It has also been shown that these bears often have an extremely high mite burden (Francisco personal communication) so removal may also alleviate some transmission risk.

This recommendation is in line with how other agencies are approaching mange. A survey of 35 state and federal personnel with bear management responsibilities from 17 states was performed in 2023 by Francisco et al at SCWDS (publication currently in review). When asked about responding to mange in wildlife (not just bears), 97% responded that severely affected animals should be euthanized, but 43% opposed the euthanasia of moderate cases and 80% opposed the euthanasia of mild cases.

The only published survival data of mange infected bears is from Pennsylvania, where 81% of bears recovered regardless of treatment protocol (Tiffin et al 2024). The survival rate of infected bears in Virginia (both in mange affected and mange emerging counties) is currently unknown, but this population parameter is one of the key questions that VDWR's current collaborative bear mange study with Virginia Tech hopes to answer (Appendix 5). Given the research from Pennsylvania and in the absence of Virginia-specific data, it seems prudent to give non-severely affected individuals a chance to recover.

Individual and population immunity is also poorly understood in bears. Similar to the disease in canids, individual immunity in bears is probably short-lived (Neidringhaus et al 2019), disease re-occurrence is common, and due to subsequent Type I hypersensitivity responses, secondary cases can even be more severe (Francisco et al in-review, Little et al 1998). Although no evidence exists for affected populations of any species developing complete resistance, populations do adapt over time. Often, when sarcoptic mange is introduced into a naïve population, a primary wave of emergence can have drastic population effects (Ferreira et al 2022, Carver et al 2023), which are then followed by periodic or sporadic, localized epizootics. The long-term dynamics of this disease in bears have yet to be worked out, but actions that could slow or interfere with host:parasite evolution and population adaptation should be avoided.

Demonstrating the Department's application of adaptive management to the presence of mange in bears, VDWR is updating its Bear Mange Response Protocol for the fourth time since 2014. Over time, this protocol has evolved from early attempts to dispatch all affected individuals to now only removing severely affected animals for welfare reasons. As stated in the Objective 1, Strategy 1 of the surveillance section, a new, standardized scoring system will be used to determine if dispatch of a bear is appropriate based on body condition, hair loss, behavior, and time of year.

Similar to bears, VDWR commonly authorizes humane dispatch for other wildlife severely-affected by mange and will continue to do so as clinical disease progression for these species leads to emaciation and presents similar animal welfare concerns. Further, spillover from canids is thought to be responsible for sporadic cases of bear mange (Schmitt et al 1987), and consistent (as opposed to random) handling of severely-affected mange individuals of all species may lead to important discoveries regarding the transmission and occurrence of mange in free-ranging populations.

Dispatch of mange-affected bears may legally be performed by department staff, local law enforcement, licensed veterinarians, animal control officers, and when authorized, members of the public. In May 2025, the VDWR Board approved a new regulation (VA Administrative Code 4VAC15-40-310) to clarify that VDWR staff, and external partner agency staff designated by the Director, can give permission to the public to humanely dispatch animals, including for disease reasons. The public must notify VDWR first, and photos and verbal descriptions will be utilized by authorizing staff to complete mange scoring and dispatch protocols. Since *S. scabiei* poses a risk to domestic animals and humans, safe carcass handling and disposal language will be provided when dispatch is authorized (Appendix 6).

Pharmaceutical treatment for severe cases is occasionally brought up in place of humane dispatch. VDWR is not recommending widespread treatment of any mange cases at this time (discussed further in Appendix 4).

Objective 2: Reduce mange transmission and prevent human-assisted movement of mange mites.

*Strategy 1: Properly dispose of infectious carcasses.*

Proper carcass management in large-bodied species presents obvious challenges, but whenever possible, carcasses of bears that are humanely dispatched (either by VDWR personnel or the public) should be removed from the landscape or buried on-site. Proper disposal methods include deep burial, placement in lined landfills, incineration (in a commercial incinerator), and digestion. Safe carcass handling and disposal language will be provided to VDWR staff and those authorized to dispatch or who find dead specimens on their property.

*Strategy 2: Avoid the relocation of bears to new areas. If movement of a bear is necessary, follow proper diagnostic and biosecurity procedures to prevent the accidental translocation of mites.*

The VDWR stopped routinely relocating bears from conflict situations in 2001, and only does so today under rare, extreme circumstances. The following protocols will be used if a decision is made to relocate a bear:

- If possible the bear should be released in the county of origin. If this is not feasible, the bear can only be moved to a county with similar mange status. Bears from mange affected areas cannot be moved to mange unknown areas.
- If field conditions allow and staff possess the necessary equipment, a skin scrape evaluation performed under sedation/anesthesia should be performed. If this cannot be performed, then prophylactic treatment can be considered.

Limited bear movements may also occur due to the VDWR's orphan surrogacy and rehabilitation programs, which are conducted in collaboration with the Wildlife Center of Virginia (WCV). A brief description of these programs, including disease prevention and management measures is below:

Surrogacy Program

Orphaned neonate cubs are placed with surrogate sows as appropriate during the denning season as a first option for an “orphan” event. VDWR is currently in the process of expanding this program more broadly across the state, so that cubs can be placed locally. Following a basic health check, cubs are often placed the same day or within 48 hours of the orphaning event and often do not receive any additional care other than basic feeding. Any cubs needing medical attention prior to placement are housed at the WCV’s indoor intensive care unit (ICU).

#### Rehabilitation Program

Orphaned cubs which are not eligible for surrogate placement (outside of the denning season, no available surrogates) are housed at the WCV for a period ranging from 6 months to 1 year prior to release back to the wild. Most commonly, these bears are released as yearlings during the spring (April) and when feasible, in their county of origin. All yearlings must have 3 negative skin scrapes to be eligible for release. All equipment taken to the WCV for the releases (traps, carriers) are disinfected with a 10% bleach solution prior to and following release events.

*Strategy 3: Continue to promote best management practices to ensure domestic canines are not involved in mite transmission.*

There is little evidence to suggest that domestic dogs are a significant source of transmitting mites to new areas or other species. Still, because they (and other domestic animals) are capable of being infested, emphasizing common preventive measures is warranted. These strategies could be added to best management practices recommendations for hunting with hounds and recreating outdoors with pets. Many prophylactic preventive strategies for other parasitic diseases (heartworm, fleas, etc.) are also effective at preventing or limiting mange, and dog owners should consult with their veterinarians to adopt a protocol that minimizes risk. Dogs that are suspected of potentially being infested should be evaluated by a trained professional and appropriately treated before being further utilized for hunting or other outdoor activities.

*Strategy 4: Limit the artificial congregation of bears.*

Transmission of sarcoptic mange is driven by direct contact between individuals or indirectly through contact with recently contaminated environments. The amount of direct vs indirect transmission sustaining the disease in bears has been speculated but is difficult to research (Browne et al 2021). Mite survival off the host has been documented for up to 13 days under ideal laboratory conditions with mites taken from infected bears

(Niedringhaus et al 2019) and 19 days with mites taken off infected dogs (Arlian et al 1984), but the infectivity of these mites over time is unknown. Indirect transmission through shared environments, like denning sites, has been implicated in transmission in some species (Cypher et al 2017, Carver et al 2023).

Any practice that artificially congregates bears has the potential to increase both direct and indirect transmission and should be avoided whenever possible. Artificial congregation can occur due to point sources (bird feeders, baiting/feeding sites, mismanagement of trash, etc.) or at larger scales (agricultural operations, etc.). It has been illegal to feed or bait bears anywhere in the Commonwealth since 2003 (VA Administrative Code 4VAC15-40-282). Maintenance of the prohibition on baiting and feeding of bears, increased outreach on the importance of avoiding these practices, and training on proper enforcement of the regulation are important measures to minimize transmission risks. Supplemental feeding of bears in mange-affected populations in Virginia is occasionally proposed by constituents as a measure to help stressed individuals and bolster population recovery efforts. Although it is thought that widespread supplemental feeding of black bears has the potential to increase fecundity and artificially inflate population densities (Kirby et al 2017), the risks of mange transmission through artificial feeding outweigh any potential benefit.

Through participation in the BearWise program, VDWR provides outreach messaging and assistance to communities and constituents about living with bears and managing artificial attractants. Although this is done primarily to mitigate bear conflicts, any progress made in this realm also has the potential to alleviate mange transmission risk.

Objective 3: Incorporate disease effects into bear population models and population management.

*Strategy 1: Adapt population models and indices to include non-hunting mortality, so that population management tools can be implemented in a timely, data-driven manner.*

As with most wildlife species, no economically practical methods exist to accurately and precisely estimate black bear population size on an annual basis across the entire state of Virginia. Population estimation techniques that involve capturing and marking bears, conducting surveys (e.g., camera, hair snare, bait station), or genetic analysis are viable on smaller study areas but are generally cost prohibitive at the regional or statewide scale. Virginia, like many eastern states (Black Bear Management Jurisdictional Survey, 2023), utilizes population reconstruction to estimate a minimum bear population index by bear

management zone and statewide. Population reconstruction modeling utilizes data from hunter-harvested animals which can be collected in a cost-efficient manner and provides the most economically responsible and sensitive annual population indices for bears at bear management zone and statewide scales.

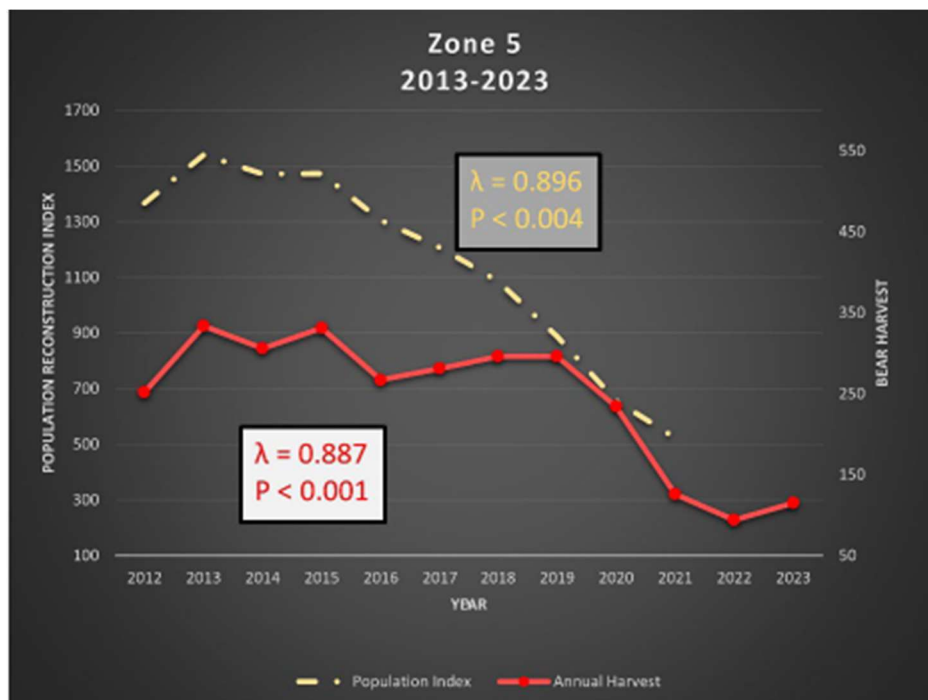
Multiple eastern states have compared reconstructed bear population indices utilizing population reconstruction to integrated population models. The results indicate that integrated population models can enhance precision of the populations indices; however, overall trends and population index values were similar for both methods. In mange affected bear populations natural mortality rates as well as harvest rates are likely variable and may strongly influence population estimates using reconstruction. Integration of natural mortality rates into population reconstruction models is one mechanism to alleviate the impact of mange on population reconstruction models. In addition to investigating natural mortality rates in mange and non-mange affected areas, DWR is also investigating and evaluating alternative population monitoring indices (e.g., occupancy modeling, SECR) which may afford other cost-effective approaches to managing bears in Virginia (See Appendix 5 for further discussion of population models.).

*Strategy 2: Adjust bear hunting seasons when necessary to reduce cumulative mortality and achieve bear population objectives.*

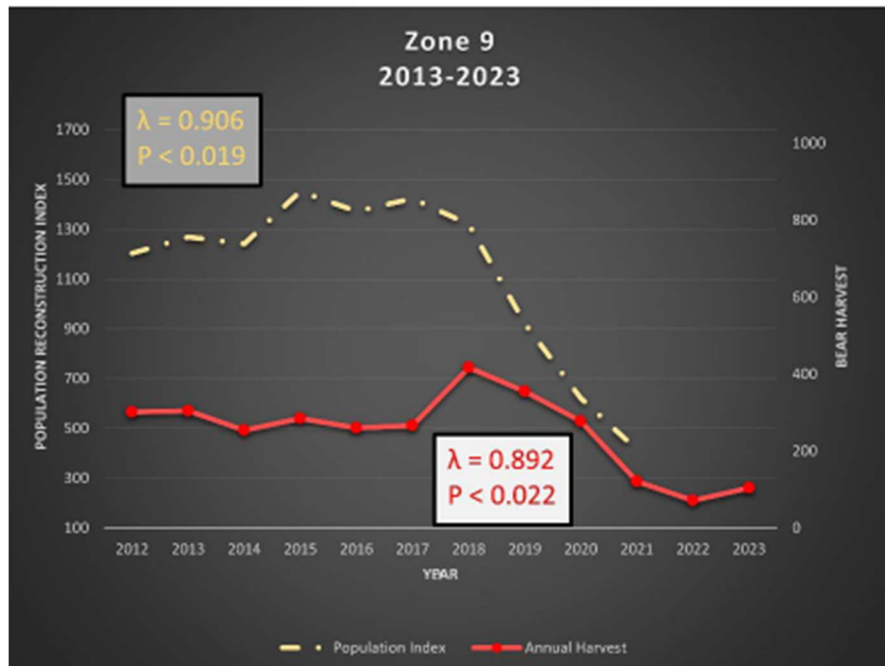
Experience in Virginia suggests that bear mortality from mange is likely cumulative with other factors such as bear harvest through hunting and bear-vehicle collisions. Although direct effects of mange on bear populations are difficult to address, reducing female bear harvest mortality through hunting season adjustments is a primary tool within VDWR's control. Whenever bear populations decline below the levels established in objectives of the 2023-2032 Bear Management Plan, bear hunting season adjustments are considered. During the 2024-2025 hunting regulation review and amendment cycle, bear seasons were reduced in 24 counties primarily located in the northwestern portion of the state where sarcoptic mange is endemic.

Harvest reductions in areas where mange has already impacted populations are critical for the ability for those populations to rebuild but can also be used pre-emptively to bolster populations ahead of mange outbreaks. Using the Shenandoah Valley of Virginia as a case study, it does not seem beneficial to reduce bear populations ahead of mange as this only seems to exacerbate the impacts that mange may have on a population. Prior to mange (or significant reports of mange) in the northern Shenandoah Valley, bear population objectives for these bear management zones were modified to "reduce" (from stabilize) in

2017. To meet this objective a new 3-day early bear season was implemented in 2018, which allowed the use of all legal weapons (archery, muzzleloader, firearms) as well as hounds and would run for 3 days during the week prior to early archery season (generally the last week of September or first week of October). This season proved to be extremely popular with many bear hunters and effective at harvesting female bears. During this timeframe, reports of sarcoptic mange in this area began to increase, with significant increases in reports noted from 2019 through present day. The combination of the high female harvest (as prescribed to meet population objectives), poor mast years which occurred during these same timeframes, and the onset of sarcoptic mange, bear populations in the Shenandoah Valley have taken a significant decline. Population reconstruction and harvest graphics for bear management zones 5 and 9 are shown below as an example of this decline.



**Figure X: Zone 5 population reconstruction and harvest, 2023.**



**Figure X: Zone 9 population reconstruction and harvest, 2023.**

Additional management strategies evaluated but *not recommended* for widespread adoption at this time.

Explanations for why certain strategies are not adopted are typically not laid out in management plans, but due to the interest of stakeholders regarding some of these items, a more detailed discussion and justification is warranted. Strategies that were evaluated by VDWR but which are not recommended at this time include aggressively targeting clinical bears for culling, widespread pharmaceutical treatment of clinical bears or populations, and establishment of disease management or containment areas. A thorough discussion about why these strategies were not adopted is in Appendix 4.

### **Section 3: Research**

#### Overview

Since VDWR began detecting cases of mange in bears in northwest Virginia in 2014, staff have continued to expand knowledge of this disease and how it may impact the management of bears. This has been done by reviewing research conducted in other states and species, implementing research efforts in Virginia, and participating in regional, multistate studies.

Due to limited internal research capacity and funding, VDWR has relied heavily on crucial external partnerships to help study sarcoptic mange. In collaboration with the Wildlife Center of Virginia (WCV), the effectiveness of several treatment protocols was evaluated, specifically ivermectin and fluralaner. The results found that although anthelmintic treatment in combination with supportive care can clear mange infestations, even in severely affected individuals (Van Wick & Hashem 2019, Van Wick et al 2020), once released back into the wild most animals become reinfested, some more severely than when first admitted (Francisco et al in review). VDWR has also contributed diagnostic samples for several multi-state research projects led by the Southeastern Cooperative Wildlife Disease Study (SCWDS) at the University of Georgia, including studies on general mange surveillance, black bear mange toxicology, bear mange skin microbiome, and bear mange mite enumeration. Lastly, VDWR is currently partnering with Virginia Tech on a large two-part project, one part studying disease progression through spatial-temporal and physiological effects of sarcoptic mange in black bears, and another evaluating bear population density estimates in mange affected vs mange unaffected areas using spatially explicit capture-recapture (SECR). These partnerships and research efforts will help guide evidence-based management not only here in Virginia but in other states being impacted by mange in black bear populations. The specifics of all the past and current research projects VDWR has been or is involved in can be found in Appendix 5.

Still, there are critical questions about mange in bears that remain partially or fully unanswered and require further study. VDWR intends to be active in this realm, helping answer these questions and continuing to contribute knowledge from its experience to the scientific community.

Objective 1: Identify future research opportunities, limitations, and hurdles.

*Strategy 1: Prioritize major knowledge gaps for future research endeavors.*

With the expansion of sarcoptic mange throughout bear populations in the mid-Atlantic, VDWR has an opportunity to be a regional leader in helping address knowledge gaps. But with significant funding constraints, efforts should be focused on answering some of the most applicable questions. The following discussion highlights some of the most important research needed to effectively address disease and population management.

- *What short and long-term impacts does mange have on bear populations?*

As previously stated, this disease is very likely to remain in Virginia, and VDWR will need to manage bear populations accordingly. An understanding of survival/mortality rates is needed, both in endemic and emerging areas. If survival in Virginia's bears is not similar to that found in Pennsylvania's bears (Tiffin et al 2024), then attempts must be made to elucidate the reasons for the difference. In addition to understanding survival/mortality rates, sub-lethal impacts to fitness and reproductive physiology must also be quantified so that they can be integrated into population models. Ongoing collaborative projects with Virginia Tech will start providing insights into these variables, but VDWR must be prepared to continue investing towards additional research in this realm.

It is plausible that selective pressures applied by the disease may be changing the genetic structure and diversity of the population. Such changes cannot be determined without a baseline understanding of the genetic diversity prior to disease emergence. It has been hypothesized that genetic bottlenecks and lack of genetic diversity could be contributing to the current emergence of the disease (see Genetic Health Marker Testing project description above). The fields of population and landscape genetics are rapidly evolving with advancing technology and could lead to numerous future project opportunities. In anticipation of expanded opportunities for genetic research, VDWR plans to begin a more thorough collection and banking protocol of bear tissues for this work.

An understanding of the role of population immunity is also lacking. Individual immunity appears relatively short-lived (Niedringhaus et al 2019) but could still contribute to the overall dynamics as the disease becomes endemic. Some species exhibit initial severe waves of disease followed by sporadic epizootics driven by environmental factors, host densities, and population immunity. Whenever opportunity arises, VDWR will attempt to collect and bank serum that could be used for serosurveys as well as population exposure and immunity studies.

- *What epidemiological or ecological knowledge is missing regarding sarcoptic mange in black bears?*

Although sarcoptic mange is an ancient disease affecting >140 mammalian species, disease epidemiology can vary significantly between species and is poorly understood in bears. A thorough understanding of transmission in bears is still lacking, hindering development of effective intervention and control strategies.

Fundamental knowledge gaps exist for the roles of direct and indirect transmission, interspecies transmission, and effects of population density.

The solitary nature of bears has led some researchers to speculate that the bulk of transmission may be indirect (Browne 2022). However, mites have limited longevity in the environment, 13 days under ideal laboratory conditions (Niedringhaus 2019). Den contamination is frequently implicated for some species (wombats, foxes, etc.) but is probably only a concern in bears denning in family groups. Basic life history can be used to make some transmission assumptions (ex: more direct contact between bears during breeding seasons), but a more thorough, quantifiable understanding of contact rates and spatial overlap (both intraspecies and interspecies) at various times of the year could lead to the development of better transmission models and possibly targeted, strategic interventions or treatments. Integrating data from collared bears, environmental sampling, and wild canid surveillance will be needed to decipher and model the complex transmission pathways.

Some herding species exhibit a high degree of density dependent transmission, but frequency dependent (or density independent) transmission has been described in other species. At present, there is no evidence that transmission of sarcoptic mange in bears is density-dependent. However, a more thorough understanding of the role that density plays in mange transmission in bears would be very useful for bear managers to implement harvest management approaches that minimize disease occurrence and transmission within the bear population. Management of bear population density at the leading edge of an expanding mange outbreak is presently a significant challenge for managers. In addition to establishing case studies regarding management experiences in such scenarios, rigorous data collection on population changes and the potential variables driving those changes provides an opportunity for retrospective analysis and study that could provide valuable insight to other bear managers facing this management challenge.

- *What surveillance or management actions require further refinement or review?*

As discussed in the Management & Response section and Appendix 4 of the plan, widespread treatment of bears or other sympatric species is not a practical response given the current state of knowledge regarding management of mange in free-ranging wildlife, but investigating treatment options under a structured,

experimental framework remains a viable strategy for advancing current knowledge on management of mange.

Prophylactic treatment (vaccination) against *S. scabiei* has been most explored in domestic rabbits, even showing some potential to reduce clinical signs, mite survival, and replication (Liu et al 2014, Shen et al 2023). But to date, there are not vaccines commercially available for use in any species. Varying levels of immune responses (especially hypersensitivity responses) exhibited by different host species add another layer of complexity that would need to be thoroughly explored before such treatment would be applicable to bears or any wildlife species. Additionally, the logistical hurdles and cost of administration to a wide-ranging wild population must also be considered. Oral vaccine programs do exist for certain diseases of wildlife affecting public health (ex: rabies) and endangered populations (ex: black-footed ferrets), but the feasibility of vaccine options for sarcoptic mange remain unknown and even if feasible, it would not be expected to be a tool available anytime soon.

An indirect enzyme linked immunosorbent assay (ELISA) is commercially available to detect Immunoglobulin G (IgG) antibodies in the serum of canids. Use of this assay in bears has been studied as both an accessory diagnostic tool and a method to evaluate population-level exposure (Peltier et al 2018, Niedringhaus et al 2020, Houck et al 2021). The detection of antibodies in serum can help confirm active disease but can also indicate prior exposure or prior disease and recovery. The temporal aspects of the humoral response in bears has not been quantified through artificial challenge studies, but serial testing post-treatment demonstrated rapidly declining titers, all falling below detectable limits within 14 weeks (Niedringhaus et al 2020). There is also likely significant variability of IgG titers due to individual immune response and level of infective dose. A study of North Carolina bears discovered an 18% seroconversion rate despite no known cases of sarcoptic mange in the state (Houck et al 2021), indicating that bears may be frequently exposed to *S. scabiei* through sympatric hosts or the environment. Further work is needed to determine whether this is true exposure or if assay cross-reactivity could be occurring to antigens from other mite species. This, combined with a better understanding of the immune response of bears, could elucidate future opportunities for serology to be used to study disease dynamics and exposure in populations; thus, VDWR will begin to bank serum samples as opportunity arises.

*Strategy 2: Advocate for adequate funding for mange research and continue to build collaborative partnerships.*

Dedicated funding sources for continued and new research will be critical in closing these knowledge gaps and making sound adaptive management decisions moving forward. As additional states experience mange in bears, regional/multi-state research projects are likely to develop (and currently are being developed). Dedicated funding needs to be in place so that Virginia can take advantage of these opportunities to partner with additional state agencies, research universities, and disease specialists on mange research and management. Partnerships with other state agencies and universities (both in state and out of state) will be critical to ensuring knowledge dissemination as research unfolds and new and emerging techniques or management strategies are developed.

## **Section 4: Communication and Outreach**

### Overview

Since 2014, when the current sarcoptic mange outbreak in bears began in Virginia, a central component of VDWR's efforts related to mange has been outreach and communication with the general public, interested hunters and landowners, and external partners and agencies (both within Virginia and regionally). Transparency and open communication with all interested parties is integral to creating and maintaining trust, and ultimately, for successful management of the disease. The enhancement and adaptation of current efforts in outreach and communication will reinforce public confidence in VDWR as the lead agency in Virginia with respect to mange in wildlife. Although beyond the scope of this management plan, the development of a comprehensive communications plan for mange in bears (and perhaps other animals) in Virginia could be useful. In lieu of a more formal communications plan, the measures outlined below represent a pragmatic approach given current circumstances and resources.

### Objective 1: Increase public awareness and transparency about mange in Virginia's bear population and VDWR's management of the disease

Efforts should address questions such as, what is known and unknown about mange, why is this disease important to wildlife managers and the public, and what is being done (or not done) about mange to include why (or why not) those items are being done. Outcomes of successful public outreach will include better public understanding of sarcoptic mange, preventing misconceptions, and acknowledgement that the agency is committed to science-based management. Respondents to a recent survey of wildlife managers and

researchers in the eastern U.S. emphasized that it is particularly important to educate residential homeowners and renters who may have limited understanding of mange as a natural disease of bears and other species (Francisco et al 2025, in review).

*Strategy 1: Develop a centralized webpage with resources for multiple species susceptible to mange and with separate links to information specific to bears and other species.*

Expanding website content to better reflect and address those mange topics which the public is most frequently searching will maximize page visits and educational effectiveness. This strategy will also help establish VDWR as the topical authority among segments of the public which may not normally consider VDWR as source of information on mange in wildlife. Many current mange-related queries pertain to topics not addressed fully by VDWR's existing online content. It will be important to address questions such as what is mange, how do pets get mange [from wildlife], is mange contagious, can humans get mange, and what does mange look like.

Website text including words and phrases likely to be relevant to users' questions is more likely to rank higher in search results and drive more traffic to VDWR online mange content. Content should generally be written at a 6th–8th grade level or lower. The language used matters: most users won't find (or find useful) content that uses significant amounts of jargon or scientific terms; consider what the visitor is going to be searching for and use common, straightforward terms and plain language. It may be beneficial to include frequently asked questions and answers regarding important aspects of mange (e.g., risks to humans and other animals, why we do not treat bears, why some bears have to be dispatched). Consider strategically leveraging images and video to enhance visibility in search results.

*Strategy 2: Expand other outreach methods and opportunities, including updates to existing flyers and factsheets, social media, in-person or virtual presentations, community events, publication of articles in various media, etc.*

Over the past few years, VDWR has expanded its outreach efforts regarding mange. The annual hunting and trapping digest now contains a full page of information on mange, reporting mange observations, and what to do if you harvest a bear with mange. In conjunction with staff in DWR's Outreach Division, bear program staff developed a new partnership with the Virginia Master Naturalist (VMN) program. Over the last 3 years, bear program and Outreach staff have trained VMN chapters across the state to provide formal presentations and tabling events on all things, including mange, related to bears. During

training, staff provide information on mange and include materials that can be disseminated to the public. Currently 18 chapters are enrolled in the program, and over the last 3 years, they have provided information to an average of 15,500 constituents per year. DWR bear program staff also serve on a national level working group updating materials associated with BearWise to include specific information regarding mange in bears.

*Strategy 3: Work with Virginia Tech researchers to maintain a public website for the ongoing Virginia Bear Mange Study to inform interested parties about research objectives and progress.*

A website specific to the ongoing VA Bear Manage Study went public in April 2025, with information on study objectives, the study team, and progress updates ([Virginia Bear Mange Study | Home](#)).

*Strategy 4: Provide periodic updates to bear hunters, landowners, and other organizations with an interest in bear mange, to include hot topics, regional news, research updates, opportunities for engagement, etc.*

Frequent communication with interested stakeholders can build trust, maintain collaborative relationships, demonstrate VDWR's concern and commitment to management of mange, and ensure that correct information regarding mange is disseminated. As mange spreads, it is important that stakeholders in newly impacted areas hear from VDWR before misinformation becomes entrenched.

*Strategy 5: Provide updates on mange research or management to the Board of Wildlife Resources' Wildlife and Boat Committee semiannually.*

Objective 2: Engage constituents to maximize reporting of bears with mange, collection of data associated with the disease, and efficiency of implementing measures to reduce transmission or impacts of mange

Efforts should address what hunters and other publics can do to help, how their information or efforts contribute to management of mange, and how to reduce risk of mange to humans and domestic animals. Opportunities to become involved give concerned citizens some ownership and investment in management of mange in bears.

A recent survey of wildlife managers and researchers in the eastern US pointed to the importance of equipping wildlife rehabilitators to assist in mange outreach and

management, given their public-facing roles with wildlife. Ideally, such outreach and communications would convey that mange occurs naturally in the wild and that many animals are able to recover from mild and moderate cases (Francisco et al. 2025, JWM in press).

*Strategy 1: Provide up-to-date guidance regarding ways the public and hunters can assist with management of mange.*

Following is abbreviated existing guidance from the current VDWR website, annual hunting and trapping laws digest, etc.:

- To help reduce the negative impact of mange in black bears, the public can minimize the congregation of bears (and other animals) by removing or securing potential attractants (e.g., discontinue feeding birds or other wildlife, secure garbage or compost containers) and help VDWR track the distribution of the disease by reporting all suspected cases of mange to the Department through the VA Wildlife Conflict Helpline ([vawildlifeconflict@usda.gov](mailto:vawildlifeconflict@usda.gov) or toll free 1-855-571-9003) or through an online platform under development. Per protocol, severely affected bears may be dispatched, either by staff or other officials or by citizens authorized by VDWR.
- Hunters should report any mange suspect bear observed during the bear hound training season to the VA Wildlife Conflict Helpline. During hunting season, if a hunter harvests a bear with signs of mange they must utilize their bear tag and report the bear at the time of harvest because this information remains a vital element of the Department's bear management program. The harvested bear should also be reported to [bearmange@dwr.virginia.gov](mailto:bearmange@dwr.virginia.gov) with the photo and confirmation number from reporting the harvest.
- Best management practices should be used when handling a mange infested bear, which should be minimized to avoid unnecessary exposure, to include wearing disposable gloves, disinfecting equipment or areas contacted by the bear, washing clothes worn when with the bear, and contacting a doctor or veterinarian regarding human or animal exposure, respectively.

*Strategy 2: Provide opportunities for hunters and others to engage in citizen science that will advance understanding and management of mange in bears.*

Following are ongoing opportunities for citizen engagement in collection of mange-related data:

- Bear observation form – Interested members of the public can report on numbers of healthy bears and bears with mange observed.
- Bear hunter log – Participating hunters can record useful metrics with regards to bear hunting (e.g., healthy and mange-affected bears seen, ran, and treed) in mange and non-mange areas.
- Hunter sampling – Participating bear hunters can collect samples, following clear and simple protocols, to support ongoing or new research/monitoring in Virginia and regionally (e.g., via SCWDS).
- Skin samples from other species affected by mange (e.g., canids) – In coordination with the furbearer program, recreational trappers, rehabbers, and commercial nuisance animal permittees can opportunistically obtain samples from mange affected-animals.

Objective 3: Ensure that staff across VDWR and partner agencies understand management of bear mange and can provide consistent messaging to constituents

*Strategy 1: Ensure that public-facing staff across VDWR are equipped with sufficient information to assist with management of mange and provide consistent messaging to constituents.*

To ensure consistency, competency, and efficiency across all operational levels, VDWR will provide information and training to all personnel involved in surveillance, diagnostics, field response, and public engagement activities.

*Strategy 2: Continue to collaborate with external agencies and partners within and outside of Virginia regarding important research and management, including the human dimensions aspects of mange (e.g., public opinions, knowledge, successful messaging).*

In 2022, Virginia hosted a multi-state meeting, attended by 22 states plus universities, to discuss the current state of knowledge of mange; this meeting initiated much of the research collaboration now occurring with other states in the region and with SCWDS. In 2023-24, VDWR participated in a multi-state survey of bear managers about effective management strategies and promoted a survey developed by SCWDS that assessed public and hunter perceptions of black bear mange management strategies, including euthanasia, treatment, and non-intervention. Within Virginia, partnerships could be enhanced with the establishment of an interagency committee to collaborate on multiple aspects of bear research and management, to include sarcoptic mange.

## **Conclusion**

VDWR takes mange in black bears seriously, with a primary goal of long-term population viability for conservation and societal benefits. Implementing diverse strategies for surveillance and monitoring, management and response, research, and communications and outreach, mange must be managed to the best of our abilities despite incomplete knowledge of the disease. Incorporating an adaptive management framework facilitates learning from prior management decisions and flexibility to change disease management strategies based upon effectiveness, emergence of new information, and public acceptance. Future bear management decisions may be influenced by new and ongoing research aimed at demonstrating how mange spreads on the landscape and evaluating the effectiveness of mange management actions in Virginia and elsewhere.

## Appendix 1: History of Mange in Bears and Other Wildlife in North America

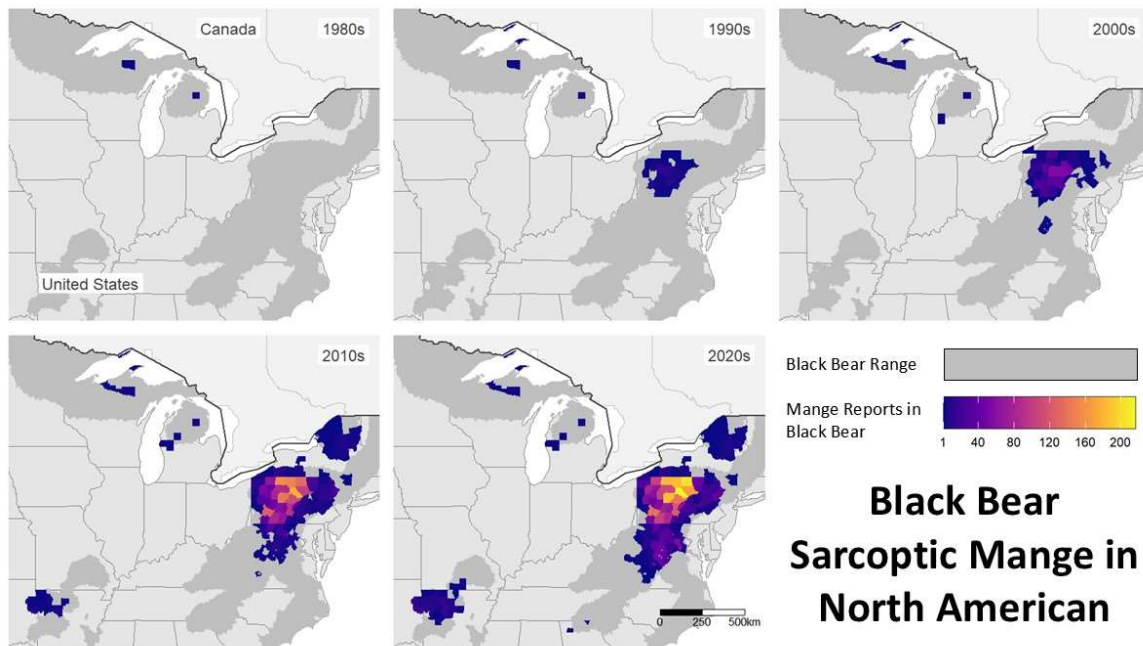
*S. scabiei* is a generalist mite that has infected at least 148 mammalian hosts (including humans and many domestic animals) across the world (Escobar et al 2021). Although a single, heterogenous species, several genetic clades exist that seem to correlate closely with the type of infected host (canis, hominis, bovis, etc.). The first reports of mange in wildlife in North America came when mites from domestic dogs were used to infect coyotes and wolves in Montana in the early 1900's, which were subsequently released in an attempt to infect predator populations more widely (Chapter 107, 1905 Montana Legislative Code). Epizootics of sarcoptic mange were then reported in red foxes in Ohio (Olive & Riley 1948), Pennsylvania (Pryor 1956), and Wisconsin (Trainer & Hale 1969).

The first published record of a mange-causing mite in black bears involved a *Demodex* species identified in a sample from a partially alopecic bear sow captured in northern Wisconsin in 1975 (Manville et al 1978). However, this case presented milder clinical signs compared to later sarcoptic infestations. Sarcoptic mange specifically entered the record in 1984 in Oscoda County, Michigan, when a young bear with hair loss, crusty skin, and poor body condition was shot and diagnosed via skin scrapings (Schmitt et al 1987). This bear had been observed alongside another symptomatic young bear, and the following spring, an adult female, presumed to be their mother, was euthanized and confirmed with sarcoptic mange, signaling early spread in wild populations (Schmitt et al 1987). It is presumed that these cases were a spillover effect from sympatric hosts, and it does not appear that the disease spread further within the local bear population.

In 1991, an adult male bear with sarcoptic mange was documented in Indiana County, Pennsylvania. Three additional cases were reported the following year, and the disease began radiating outward to affect additional counties. Over a span of nearly 30 years, the disease had been confirmed in bears in 55 out of PA's 67 counties and spread into nearby states with contiguous populations, including West Virginia in 2003, Maryland in 2008, and New York in 2011 (Niedringhaus et al 2019) (see Figure 1). A cluster of cases in eastern Oklahoma, northwest Arkansas, and southwest Missouri has also emerged, with the first reports in those states occurring in 2016, 2018, and 2020, respectively (SCWDS unpublished data).

Virginia reported suspected mange case in a bear cub in Rockingham County in late 2003, including histopathological samples that were sent to SCWDS. Mange was confirmed, but was suspected to be ursicoptic and not sarcoptic. Two additional suspected cases were reported in 2004. The first was a yearling from Augusta County, which was also diagnosed

with *U. americanus*. The second was an adult female bear from Rockingham County. This bear was captured, treated at WCV, ear-tagged, and released. *S. scabiei* mites were recovered from skin scraping at the time of intake, making this Virginia's first confirmed case of sarcoptic mange in bears. It is unclear whether this case was the result of opportunistic spillover from wild canids or regional spread from other bears. Regardless, no additional cases were reported to VDWR until 2014.

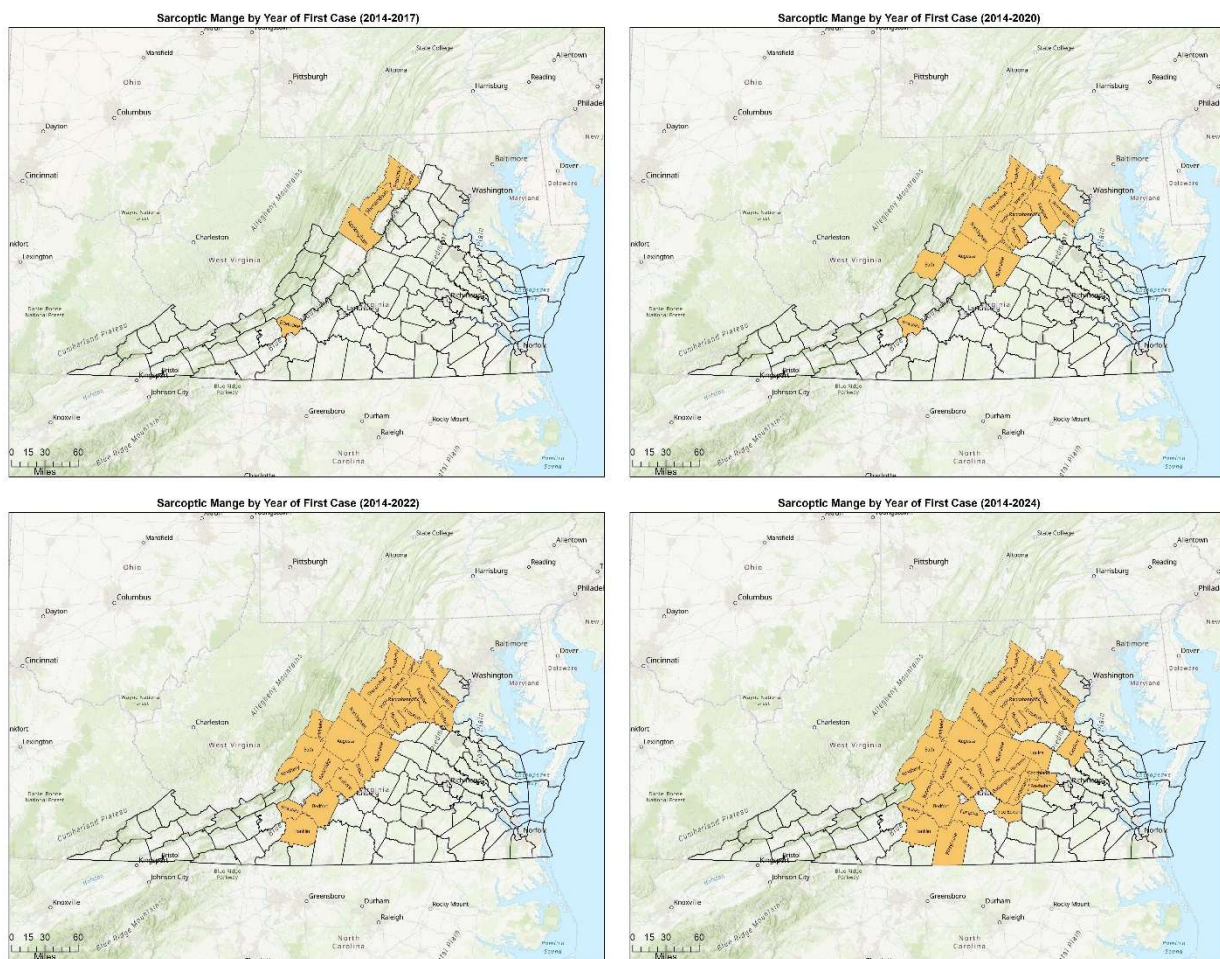


**Figure 1.** Heat map of the distribution of sarcoptic mange reports of black bears by decade in North America from the 1980's-2020's (SCWDS, unpublished data).

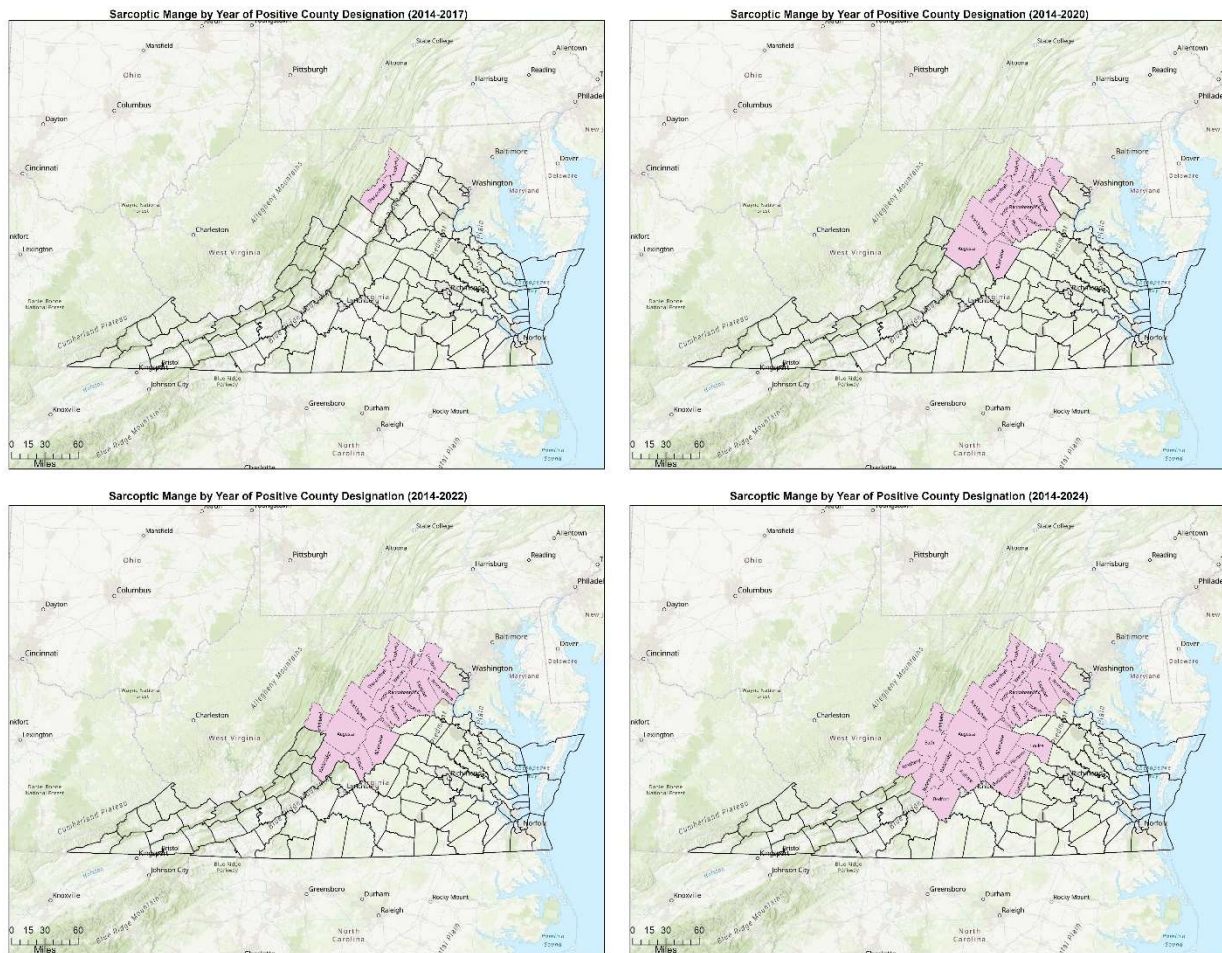
Beginning in 2014, DWR began receiving public reports of suspected mange in bears in northwestern Virginia counties. Table 1 shows the number of confirmed/suspected cases received by VDWR by year beginning in 2014. In 2020, the number of reports increased drastically. It is unknown to what degree this is reflective of expanded prevalence of the disease versus increased reporting by the public. In 2020, DWR released multiple outreach documents to the public asking constituents to report suspicious cases, and the onset of the SARS-CoV2 pandemic also led to a large uptick in the number of Virginians spending time outdoors. The graphs in Figure 2 show the serial geographic expansion of affected Virginia counties between 2014 and 2024.

| Year | Reports | # Counties with Reports |
|------|---------|-------------------------|
| 2014 | 2       | 1                       |
| 2015 | 2       | 1                       |
| 2016 | 14      | 1                       |
| 2017 | 12      | 5                       |
| 2018 | 22      | 8                       |
| 2019 | 29      | 12                      |
| 2020 | 110     | 15                      |
| 2021 | 121     | 19                      |
| 2022 | 123     | 18                      |
| 2023 | 162     | 23                      |
| 2024 | 274     | 33                      |

**Table 1:** Breakdown of bear mange reports (both confirmed and suspected) received by VDWR between 2014 and 2024.



**Figure 2.** Graphs showing southern and eastward expansion of sarcoptic mange in bears from 2014-2024. All counties with at least one case are highlighted.



**Figure 2.** Graphs showing southern and eastward expansion of sarcoptic mange in bears from 2014-2024. All counties meeting “mange affected” status as described in Objective 1, Strategy 2 of the surveillance section.

## Appendix 2: Mange Mites in Black Bears

*Sarcoptes scabiei* is a microscopic mite within the acarid subgroup of eight-legged arachnids. This tiny mite features a rounded, flattened body with short, sturdy legs equipped with claws and dorsal spines. These characteristic adaptations enable it to burrow efficiently into a host’s skin. Female mites excavate tunnels up to 1 cm long in the epidermis. A single female may lay 3-4 eggs daily, totaling over 50 eggs, during a 4-6 week lifespan (Arlian & Morgan 2017). Eggs then hatch into larvae within 3-4 days, and these larvae migrate to the skin surface to mature into nymphs and adults, perpetuating the

infestation through rapid reproduction. Its life cycle, which encompasses eggs, larvae, nymphs, and adults, unfolds entirely on or within the bear, completing in approximately two weeks under warm, humid conditions. This efficient cycle facilitates the mite's spread within and between hosts.

Sarcoptic mange has affected at least 148 mammalian species across 39 families, including being the causative agent of scabies in humans. Evolution across a broad geographic range has resulted in several host-adapted variants (e.g. *canis*, *hominis*, *suis*, etc.). In North American wildlife, sarcoptic mange has been reported in foxes, wolves, coyotes, white-tailed deer, fishers, raccoons, porcupines, feral swine, fox squirrels, swamp rabbits, house mice, and bighorn sheep (Niedringhaus et al 2019). Initial genetic analysis of mites from bears in Pennsylvania and nearby sympatric species utilizing ITS-2 and *cox1* genes revealed that several mite genetic variants may be circulating (Peltier et al 2017), but subsequent genetic work performed at SCWDS using *cox* genes and whole mitochondrial sequencing has revealed that the mites indeed do genetically cluster regionally and across host species (Francisco et al unpublished data). Mites from bears and sympatric hosts in the mid-Atlantic region appear to be genetically related and most similar to a clade of North American mites of canine origin.

Transmission of *S. scabiei* most commonly occurs through direct contact of infected individuals, but indirect contact through contaminated environments can also play a role. Mite survival off the host has been documented for up to 13 days under ideal laboratory conditions with mites taken from infected bears (Niedringhaus et al 2019) and 19 days with mites taken off infected dogs (Arlian et al 1984), but the infectivity of these mites over time is unknown. Cool, humid environments appear to favor longer mite survival, with freezing temperatures and hot summer temperatures contributing to more rapid mite death (Niedringhaus et al 2019). Host life history and biology likely also contribute to the amount of direct vs indirect transmission within a population (Browne et al 2020), but the relative proportion of direct vs. indirect transmission in bears is not fully understood. July is currently the month during which VDWR receives the highest number of suspected reports followed by May, June, and August (see Table 2).

Some species exhibit a high degree of density dependent transmission (Fernández-Morán et al 1997, Ferreyra et al 2022), but frequency dependent (or density independent) transmission has been described in other species (Niedringhaus et al 2019, Carver et al 2023). The relative effects of how density affects transmission in bears is also poorly understood and needs to be further studied. Finally, although spillover from sympatric canid hosts is hypothesized as the disease entry point into bear populations, their role in

the maintenance and transmission of the disease in bear populations is not fully understood.

| Month        | Cumulative Reports |
|--------------|--------------------|
| January      | 55                 |
| February     | 46                 |
| March        | 56                 |
| April        | 62                 |
| May          | 111                |
| June         | 101                |
| July         | 142                |
| August       | 99                 |
| September    | 55                 |
| October      | 49                 |
| November     | 56                 |
| December     | 39                 |
| <b>Total</b> | <b>871</b>         |

**Table 2:** 2014-2024 cumulative suspect bear mange reports received by VDWR, by month.

Other mite species exist with the potential to cause clinical mange in bears, including demodectic mange caused by *Demodex ursi* and ursicoptic mange caused by *Ursicoptes americanus*.

- *Demodex* spp.: These cigar-shaped mites, natural inhabitants of hair follicles and sebaceous glands in mammals (e.g., dogs, cats, humans), cause demodectic mange or demodicosis. *Demodex ursi* causes demodectic mange specific to black bears. Their life cycle—egg, larva, protonymph, deutonymph, adult—occurs entirely within follicles, typically as harmless commensals, though disproportionate mite burdens may become problematic in immunocompromised individuals such as those stressed by malnutrition, injury, or disease. Reports of clinical outbreaks historically appear restricted to black bear populations in Florida, manifesting as localized hair loss (e.g., face, limbs) or, rarely, generalized alopecia with redness and scaling (Forrester et al 1993). The first documented case in black bears was reported from northern Wisconsin in 1975, when *Demodex* mites were recovered

from scab tissue of a partially alopecic sow (Manville et al 1978). No confirmed records of demodectic mange exist from Virginia.

- *Ursicoptes americanus*: This host-specific mite causes ursicoptic (audycoptic) mange, burrowing near hair follicles in bears. Initially identified in a captive black bear from Kansas without clinical signs, its first association with disease came in July 1975 from an Idaho bear with severe generalized alopecia (90% head hair loss) and pronounced skin lesions on the neck, thorax, and forelimbs (Yunker et al 1980). The mite is similar to *S. scabiei*, aside from subtle morphology differences and its restriction to hair follicles like *D. ursi* (Yunker et al 1980). Clinically normal bears can harbor *U. americanus* with minimal or no clinical signs, though when signs appear, they are often less severe than those of sarcoptic mange; co-infestations with *S. scabiei* have been documented with overlapping clinical signs, complicating diagnosis (Broadhurst et al 2025). Although the prevalence of *U. americanus* on bears in Virginia is unknown, a recently published study noted that mites were found on 14.7% of bears handled at the Wildlife Center of Virginia between 2014 and 2023 (Broadhurst et al 2025).
- *Chorioptes* spp.: These surface-dwelling mites, common in livestock (e.g., cattle, sheep - dubbed “foot mange” or “leg mange”), feed on epidermal debris rather than burrowing. Chorioptic mange was first detected in a free-ranging Massachusetts black bear in 2019 linked to skin lesions (Niedringhaus et al 2021), but this was a unique case and remains rare in wildlife.

### **Appendix 3: Mange Pathogenesis and Other Causes of Skin Disease**

Clinical signs of sarcoptic mange can vary from mild to severe. Subclinical infections have not been diagnosed in bears but have been noted in other species. Early lesions manifest as small, red, inflamed spots (2-3 cm wide), often starting on the ears, elbows, or abdomen and spreading as the infestation intensifies. Alopecia is noted and can range from localized (small patches) to generalized (extensive lesions) in severe cases. In more severe cases, the skin becomes chronically inflamed and malodorous, often with secondary bacterial and yeast infection. This inflammation and infection leads to a breakdown in epithelial barriers, and serum leaks from damaged tissues which dries into yellowish crusts or scabs. The skin becomes thickened and lichenified. In canids, the skin inflammation is mediated by type I hypersensitivity responses to the mites or foreign material deposited in the skin, and it is likely this also occurs in bears (Niedringhaus et al 2019). Chronic mange can appear as thickened, leathery skin exposed by alopecia. These extensive skin changes compromise the skin’s essential functions, such as maintaining fluid balance and protecting against water loss. Energy depletion from constant scratching and immune response drains fat reserves, while lost insulation impairs thermoregulation. In severe

cases, bears are often emaciated. As these signs progress into the advanced stages of the disease, there is an increased potential for starvation and death.

In comparison, ursicoptic mange can present subtly in normal bears with mild alopecia around the face and muzzle or escalate to more severe hair loss and crusty lesions in extreme cases, overlapping with sarcoptic mange signs and potentially complicating gross diagnosis, particularly when co-infestations occur (Broadhurst et al., 2025). This information reinforces the importance of careful sampling and diagnosis to distinguish it from other mites and assess co-morbidity.

Several other skin conditions can present clinical signs overlapping with sarcoptic mange in black bears. Accurate differentiation among these conditions requires thorough diagnostic evaluation, including skin scrapings, histopathology, fungal culture, and microscopic examinations, to ensure appropriate diagnosis.

- **Pelodera dermatitis:** Pelodera dermatitis, also known as rhabditic dermatitis, can also present clinical signs similar to mange in black bears. It is caused by the free-living nematode *Pelodera strongyloides*, typically found in moist, decomposing organic matter. Bears with Pelodera dermatitis may exhibit alopecia, redness, crusty and thickened skin lesions, inflammation, and severe pruritus (itchiness), which closely mimic the clinical presentation of sarcoptic mange. Lesions commonly occur in areas of prolonged contact with contaminated soil or bedding, such as limbs, abdomen, and ventral surfaces. Unlike sarcoptic mange, however, Pelodera dermatitis often involves superficial skin layers rather than deep burrowing mites (Fitzgerald et al 2008).
- **Trichophyton sp. (Ringworm):** A study conducted between 2014 and 2019 in California documented generalized dermatophytosis in eight juvenile black bears. These bears, originating from different regions, presented with emaciation, alopecia, and exfoliative dermatitis, ultimately resulting in death or euthanasia. Histopathological examinations revealed generalized hyperkeratotic dermatitis, folliculitis, and furunculosis, with skin structures heavily colonized by fungal hyphae and arthrospores. Fungal cultures identified *Trichophyton equinum*, a zoophilic dermatophyte typically associated with equids and rarely reported in non-equid species. The study hypothesized that factors such as illness, malnutrition, age, or immunosuppression may have increased the bears' susceptibility to this generalized fungal infection (Clothier et al 2022).
- **Seasonal Shedding:** Seasonal shedding in black bears can mimic sarcoptic mange primarily through extensive hair loss, patchy coats, and a rough appearance, especially during late spring and early summer. During this normal physiological process, bears naturally lose their thick winter coats in irregular patches,

sometimes revealing dry, dull, or flaky underlying skin. This appearance can resemble the patchy alopecia and roughened skin typically associated with mange. However, unlike mange, seasonal shedding does not usually involve skin inflammation, crust formation, or abnormal weight loss. Additionally, bears undergoing seasonal shedding typically regrow healthy, uniform coats within weeks, whereas bears with mange may take longer to recover or continue to deteriorate without intervention.

- **Pantsless Bear Syndrome:** This hair loss phenomenon on the hind end of black bears has been observed in multiple southern states. The exact cause is unknown but may be attributable to chronically wet environments.
- **Allergic Dermatitis:** Allergic reactions to environmental irritants, insect bites, or plants can lead to generalized itching, hair loss, thickened skin, and crusting.
- **Ectoparasites (Ticks, Fleas, Lice):** Severe infestations with ticks, lice, or fleas may cause significant hair loss, skin irritation, and dermatitis. Close examination typically reveals a heavy burden of visible parasites on the skin.
- **Nutritional Deficiencies or Starvation:** Poor nutritional status or starvation may result in generalized hair loss, dull coat, flaky skin, and overall poor condition.

#### **Appendix 4: Management Strategies Not Recommended for Widespread Adoption**

The following discussion intends to provide some context and justification for why these strategies were not recommended.

- *Aggressively targeting clinical individuals for selective or non-selective culling.*

While this approach has not been tried in bears, there are published reports of its use in ruminant herds in Europe (Alasaad et al 2012, Espinosa et al 2020). The authors of these reports noted that this strategy was controversial, difficult to measure impacts, and never proven to be an effective strategy. Given public scrutiny of dispatching bears involved in significant human-bear conflict situations, application of an aggressive, targeted culling program is likely to draw considerable public interest and scrutiny. Although the opportunistic removal of severely affected individuals is recommended above, the distinction between such intervention for animal welfare purposes and the aggressive culling of bears for disease control is notable. For example, although much is still to be learned, bears that survive mange and reproduce subsequently may contribute to population level genetic resistance. Given these sociological and epidemiological factors, it would be inappropriate to initiate such a program in Virginia without a solid, scientific basis establishing the success of this approach. Further, aggressively finding,

targeting, and dispatching individual bears using any methodology for capturing bears would be labor intensive and within free-ranging populations, likely to miss intended target animals.

- *Widespread pharmaceutical treatment of clinical individuals or populations.*

Treatment of mange in bears has generated a lot of interest and discussion. There are several effective treatment options available for domestic dogs and other domestic species (see end of this section). Research on treatment of bears has been limited to ivermectin and fluralaner (Van Wick & Hashem 2019, Tiffin et al 2024, & Francisco et al in-review). It has been shown that treatment of affected bears (sometimes even in severe cases) can contribute to recovery, but the picture is complicated by natural recovery rates as well as immune dysfunction leading to severe, subsequent re-infections. For instance, in Pennsylvania 88% of ivermectin treated bears recovered, but 74% of un-treated bears recovered naturally (Tiffin et al 2024). With this data in mind, the Pennsylvania Game Commission stopped the routine practice of treating clinically affected bears (DiSalvo personal communication). Fourteen adult bears held at the Wildlife Center of Virginia (WCV) were successfully treated with either fluralaner or ivermectin (Van Wick & Hashem 2019, Francisco et al in-review). Four were fitted with radio-collars before release and all died between 76 and 694 days post-release, 3 from severe mange cases and one from unknown causes found decomposing in a den. The ten additional bears successfully treated at WCV were ear-tagged before release; 1 was successfully harvested by a hunter, 1 is thought to have been harvested, 1 was hit by a vehicle, and 7 had unknown fates (Francisco et al in review). Due to these results, VDWR and WCV stopped the labor-intensive practice of capturing, transporting, holding, and treating bears.

Treatment at a landscape or population level presents another set of logistical and ethical hurdles, including effective dosing and administration, adverse effects on non-target species or the environment, potential drug residues in a consumed species, and the opportunity for the development of drug resistance (Moroni et al 2020). For these reasons, treatment is rarely used except in small, isolated populations (Cypher 2017, Oleaga 2019, Rudd et al 2020). A 2019 review of all known treatment programs in wildlife, including ivermectin placed in feed for ruminants in Europe and topical application of ivermectin to wombats in dens, found that although short-term successes were documented in some individuals, long-term post-treatment monitoring was often insufficient to demonstrate a

statistical benefit to the population (Rowe et al 2019). This was emphasized in a subsequent response to the review, with the authors concluding that “pharmacological treatment of mange in wild animals mostly produces individual healing, but its effects on achieving control or eradication in a population are mostly inconclusive” (Moroni et al 2020).

Due to the logistical hurdles, potential consequences, and a lack of demonstrated effectiveness regarding whether treatment programs can benefit populations, VDWR does not intend to adopt widespread treatment protocols for any mange affected animals at this time, including bears. Appropriate outreach will be required to convey this approach to the public as treating of affected wildlife is something the public often expects (Francisco in review). Provided that adequate resources exist, there remains opportunity to study certain treatment protocols at small, controlled scales and to explore the development of tools that could be applied at a landscape level. However, it is critical that such research be conducted in a controlled manner that can generate statistically relevant data from which reliable results can be gained to advance the understanding of mange treatment on the landscape.

The following drug classes are most often used to treat sarcoptic mange:

### **Macrocyclic Lactones**

Historically, mange has been treated with drugs like ivermectin or selamectin, often requiring multiple doses due to the mites’ life cycle. These antiparasitic drugs fall under the umbrella class of macrocyclic lactones, and work by killing the mites responsible for the infestation. However, treatment with macrocyclic lactones typically requires multiple doses over several weeks. The most commonly used treatment option for sarcoptic mange is repeated injections of ivermectin, but its long-term effect on survival is difficult to monitor in free-ranging wildlife (Rowe et al, 2019, Moroni et al 2020).

### **Isoxazolines**

Newer isoxazoline drugs, such as Sarolaner (Simparica®) and Fluralaner (Bravecto®), offer long-acting relief. Fluralaner, approved for dogs in 2014, is better studied and preferred, having shown some early promise in treating sarcoptic mange in black bears (Van Wick & Hashem 2019; Van Wick et al 2020). The drug, which is commonly used as a flea and tick preventative in domestic cats and dogs, operates by inhibiting ligand-gated chloride channels in the neurons of arthropods,

which includes mites. This mechanism makes it effective at eliminating mites without harming the mammalian host. A notable advantage of fluralaner, in comparison to ivermectin, is that a single dose can provide prolonged protection against parasites, potentially eliminating the need for repeated treatments in black bears.

- *Establishment of disease management or containment areas.*

The establishment of disease management areas is frequently used to contain or slow the movement of infectious agents in populations. Extensive consideration was given to their implementation for sarcoptic mange management, but at this point, it is not recommended for the following reasons:

- The disease has rapidly advanced in the population over the past 5 years, affecting new counties each year. As such, DMA designations would need to change frequently, complicating effective communications strategies for disseminating appropriate information.
- There are currently no strategies recommended for implementation that require that “mange affected” areas have different management actions in place than in areas without mange detections, and thus no distinction is needed at this point. Should any such strategies choose to be adopted, DMAs could be established (with defined criteria) if needed.

Population management decisions can (and should) be made using the defined geographic criteria established the VDWR’s Black Bear Management Plan (i.e., bear management zones).

## **Appendix 5: Past and Current VDWR Research Project Contributions**

**Treatment of Sarcoptic Mange in Bears** – Between 2016 and 2023, 14 adult bears were transported to the Wildlife Center of Virginia for treatment and rehabilitation.

**Timeline:** 2016-2023

**Funding Source(s):** VDWR & WCV Operational Funds

**Principal Investigator(s):** Peach Van Wick, DVM, Karra Pierce, DVM

**Co-Investigator(s):** Megan Kirchgessner DVM/PhD, Katie Martin, MS, Raquel Francisco, DVM, MS, Jillian R. Broadhurst, Marcelo Jorge, PhD, Michael J. Yabsley, PhD, John Tracey, DVM

**Collaborating Institutions:** Wildlife Center of Virginia, University of Georgia (SCWDS), VDWR

**Status:** Concluded. Initial results exhibited great promise for complete clinical resolution of the disease with a single dose of fluralaner (Van Wick et Hashem 2019), but long-term follow-up utilizing GPS collars on four successfully treated bears found that reinfection with *S. scabiei* was common, leading to clinical disease often more severe than the original case (Francisco et al in-review).

**Bear Mite Burden** – This study evaluates the relationship between *Sarcoptes* mite burdens on different regions of a black bear's body and across disease severity categories. Samples from roughly 30 bears were categorized into severity groups (normal, mild, moderate, severe, recovering). Findings will guide diagnostic protocols by identifying the most reliable body region(s) for mite detection and offer insights into disease pathogenesis. The work directly supports management efforts to refine diagnostic sampling strategies.

**Timeline:** January 1, 2023 – December 31, 2023

**Funding Source(s):** Multistate Conservation Grant Program (MSCGP) – Wildlife Restoration Fund

**Principal Investigator(s):** Michael J. Yabsley, PhD

**Co-Investigator(s):** Jillian R. Broadhurst

**Collaborating Institutions:** University of Georgia (SCWDS), AGFC, WVDNR, VDWR, NYSDEC, MDC

**Status:** Ongoing (Sample Collection CLOSED)

**Mange Toxicology** – This project investigates toxin exposure in black bears with sarcoptic mange, particularly anticoagulant rodenticides and other environmental contaminants. Liver samples from bears across Arkansas, Virginia, and West Virginia are analyzed for toxicant burdens to determine whether toxin exposure correlates with increased mange susceptibility or severity. Preliminary findings suggest potential immunosuppressive effects of toxins, but further investigation is required to establish causation.

**Timeline:** January 1, 2023 – December 31, 2023

**Funding Source(s):** Multistate Conservation Grant Program (MSCGP) – Wildlife Restoration Fund

**Principal Investigator(s):** Michael J. Yabsley, PhD

**Co-Investigator(s):** Raquel Francisco, DVM, MS

**Collaborating Institutions:** University of Georgia (SCWDS), UC Davis 29 Toxicology Laboratory, MDC, AGFC, WVDNR, VDWR, NYSDEC

**Status:** Ongoing (Sample Collection CLOSED)

**Bear Mange Microbiome Study** – Partnership with the University of Arizona investigating how sarcoptic mange alters the skin microbiome (bacterial and fungal communities) of American black bears (*Ursus americanus*). The goal is to characterize dysbiosis associated with mange severity and explore secondary infections that may complicate recovery. The study aims to guide future therapeutic interventions by wildlife agencies and rehabilitation centers.

**Timeline:** 2023–2025

**Funding Source(s):** Morris Animal Foundation (MAF)

**Principal Investigator(s):** Raquel Francisco, MS, DVM

**Co-Investigator(s):** Leigh Combrink, PhD, Michael J. Yabsley, PhD, Natalie Rose Payne

**Collaborating Institutions:** University of Georgia (SCWDS), The University of Arizona School of Natural Resources and the Environment, VDWR, NYSDEC, AGFC

**Status:** Ongoing (Sample Collection CLOSED)

**Genetic Health Marker Testing in Mange Bears** – This study evaluates the diversity of the major histocompatibility complex (MHC) class II genes in black bear populations affected by sarcoptic mange. It tests the hypothesis that populations exhibiting lower MHC diversity are more susceptible to severe mange, potentially informing future conservation genetics efforts and bear management practices.

**Timeline:** 2023–2025

**Funding Source(s):** Morris Animal Foundation (MAF) 31

**Principal Investigator(s):** Raquel Francisco, MS, DVM

**Co-Investigator(s):** Erin Lipp, PhD, John Wares, PhD, Michael J. Yabsley, PhD, Bernardo Mesa, PhD, Marcela Kelly, PhD

**Collaborating Institutions:** University of Georgia (SCWDS), East Stroudsburg University of Pennsylvania, Virginia Polytechnic Institute and State University; AGFC, MDC, NCWRC, PGC, WVDNR, VDWR, NYSDEC

**Status:** Ongoing

**Human Dimensions of Mange Management** – This project assesses public and hunter perceptions of black bear mange management strategies, including euthanasia, treatment, and non-intervention. Surveys conducted across endemic, emerging, and low-prevalence states measure knowledge of mange, risk perceptions, trust in agencies, and support for management actions. Findings aim to inform communication strategies tailored to different stakeholder groups, facilitating greater public understanding and acceptance of wildlife disease management.

**Timeline:** January 1, 2023 – December 31, 2023

**Funding Source(s):** Multistate Conservation Grant Program (MSCGP) – Wildlife Restoration Fund

**Principal Investigator(s):** Michael J. Yabsley, PhD

**Co-Investigator(s):** Elizabeth Pienaar, PhD; Raquel Francisco, DVM, MS

**Collaborating Institutions:** University of Georgia (SCWDS); Georgia Department of Natural Resources (GADNR), WVDNR, VDWR

**Status:** Ongoing (Sample Collection CLOSED)

**Population and Demographic Impacts of Sarcoptic Mange on VA Black Bears and Implications on Harvest Season Structure based on Predictive Densities in Mange and Non-Mange Affected Areas** – This research assesses bear density/abundance between mange and non-mange affected areas by utilizing hair snare surveys combined with spatially explicit capture-recapture (SECR) based DNA extraction modeling in mange affected (endemic area and newly emerging mange area) and non-mange affected areas for a minimum of 3 years. Results will help understand if sarcoptic mange outbreaks have resulted in population declines by combining estimates of abundance (objective 1) with vital rate estimates to model the population growth rate of mange affected and non-mange affected areas. Vital rate data will be collected through utilization of GPS collared bears in both mange affected and non-mange affected areas. Estimates of stage specific survival and reproductive rates in both populations will provide critical metrics to pair with density estimates from objective 1. The study will use vital rate data (objective 2) to model population viability under a variety of mange and harvest impact scenarios to determine if, and by how much, harvest needs to be reduced or timing of seasons altered to prevent population declines. Additionally, the data will be used to investigate potential behavioral and physiological mechanisms by which mange causes declines in vital rates (e.g. denning behavior, reduced foraging, increased activity and space use).

**Timeline:** April 1, 2024 – on going

**Funding Source(s):** Virginia Department of Wildlife Resources

**Principal Investigator(s):** Brett Jemser and Marcella Kelly

**Co-Investigator(s):** Fang Chen, PhD Candidate; Madison Thurber, MS Candidate; Isabella Sciarrino, MS Candidate; Katie Martin, VDWR Bear Project Lead; John Tracey, VDWR Veterinarian; Carl Tugend, VDWR Bear Project Lead

**Collaborating Institutions:** University of Georgia (SCWDS); Virginia Tech University, VDWR

**Status:** Ongoing

## **Appendix 6: Human Health Considerations**

Sarcoptic mange is a zoonotic disease, and humans can become infected by handling infested animals. Symptoms may include temporary skin irritation accompanied by red, itchy welts. However, these symptoms are often transient, and infection is usually self-limiting due to the host specificity of *S. scabiei*. True scabies in people is caused by the hominid variant of *S. scabiei*. Contact should be avoided, especially for people with poor immune function, including those receiving immunosuppressive treatments and young children, as symptoms may be prolonged in some cases. Accordingly, hunters should wear disposable gloves during skinning or field dressing and thoroughly wash hands. If a potentially infected animal is handled, skin exposure can be avoided by wearing full length sleeves and pants followed by appropriate clothing laundering.

## Appendix 7: Population Monitoring Glossary

- **Population Reconstruction:** population analysis technique utilizing age at time of harvest and the backward addition of cohorts to estimate a minimum population size over time. Natural mortality is not generally taken into consideration but can be added to the model if known.
  - Pros: Data (harvest and age) is easily available and distributed across the state (and bear management zones). Costs of population reconstruction are also very low as the only input cost is generally the aging of harvested bear teeth by the laboratory. Current teeth aging costs for approximately 2500 bears per year in Virginia is \$18,000 annually.:
  - Cons: The lag in population estimation indices behind harvest (for most precise estimates a 3-year lag is utilized) is problematic, particularly for populations with unstable trends. The estimates are also less accurate when the proportion of non-harvest mortality is substantial.
  - Integrated population models combine multiple data sources and often utilize Bayesian frameworks to increase the robustness of population estimates and account for uncertainty in these estimates. Integrated models often utilize age at time of harvest data from population reconstruction plus incorporate other data sources (often unique by state or area of interest) such as abundance estimates from mark-recapture, spatial data (movement data from collared animals), and non-harvest mortality. Integrated models are more costly to develop and run due to the additional input data required. Data availability varies from state to state, and even within states, depending on research and management objectives, budgets, and staffing levels.

- **Occupancy Modeling:** statistical modeling technique to study distribution and habitat use as well as detection probability of target species. This method utilizes non-invasive sampling from cameras deployed over a spatial array to determine detection/non-detection at each site thus allowing the ability to calculate the probability of a site being “occupied” by the target animal. Habitat characteristics, human influence (e.g. distance to roads), and seasonality can all be accounted for within occupancy modeling.
  - **Pros:** Non-invasive sampling method (cameras) which reduces costs and effort and provides valuable information on habitat use and probability of occupancy under different environmental conditions.
  - **Cons:** Labor intensive during camera deployment/recovery and does not provide density/abundance estimates, simply presence/absence of a site being occupied.
  - This methodology is being utilized (primarily due to the low input costs) to monitor bear populations in the northern Shenandoah Valley mangle endemic area beginning in 2025. Camera arrays will be utilized for a minimum of 2 field seasons (preferably 3) to determine occupancy, habitat use, and detection probability in this area which has noted declining bear population trends in recent years.
  
- **Capture-Mark-Recapture:** utilizes marked individuals and recapture rates to estimate population size. Basic mark recapture models assume closed populations with no significant birth, death, immigration, or emigration throughout the study period, and are used in black bear population estimates by some states. Pennsylvania notably runs one of the largest mark-recapture efforts of any eastern state, tagging over 700 bears each year with the recaptures counted during their bear harvest season (# of tagged bears in the harvest each year). The most commonly utilized formula for mark-recapture is the Lincoln Peterson Formula ( $N = (M \cdot C) / R$ ) where:
  - N= Population Size
  - M = number of animals initially marked
  - C = total # of animals captured in the 2<sup>nd</sup> capture event (capture effort or harvest)
  - R = number of recaptured marked animals in the 2<sup>nd</sup> capture event (capture effort or harvest)

While physical marks (ear tags) were the common method for marking bears for many years, advancements in genetics have now allowed for non-invasive sampling utilizing

hair samples. Hair corrals (small wire enclosures) can collect hair samples as bears cross the wire which are then analyzed for DNA in the hair follicles to uniquely identify individual bears. These identified bears are considered “marked”.

- Pros: Increased accuracy and precision of density estimates can be gained by using mark-recapture but are dependent on the size of the area sampled and the number of individuals captured. Mark-recapture is often used within defined boundaries (e.g., National Park, management unit, etc) rather than across a statewide scale.
- Cons: Scaling mark-recapture efforts beyond a single management unit (county or zone or park for example) can be manpower intensive and expensive. Mark-recapture utilizing actual capture and tagging for black bears involves the cost of staff time, immobilization chemicals, tags, monitoring equipment, and traps. Trapping and tagging animals is also not without some risk and stress to the animal that occurs during the capture and handling event. The utilization of hair corrals for non-invasive mark-recapture are also manpower intensive and expensive to scale beyond single management units. Following the initial installation of hair corrals across a defined grid, hair must be collected (generally weekly) for a set amount of time (6-8 weeks). DNA extraction and genetic analysis costs vary but are not cheap, especially depending on the size of the area sampled and number of hair samples processed. Additionally, mark-recapture models provide a population estimate for that point in time (single year) and must be repeated to provide trends in populations. For smaller research units, efforts may be repeated yearly while for larger areas, every 5 to 10 years is more common.
- **Spatially Explicit Capture Recapture:** SECR utilizes the same principles as mark-recapture but includes spatial data such as the location of detection/capture, all detection points on the landscape, and animal home range size and movement histories. The most common method utilized with SECR models for black bear population estimation is hair sampling from noninvasive hair corrals or rub sites set up along a random grid. The use of spatial factors (forest cover, food availability, proximity to roads, agricultural lands, etc) allow modeling to incorporate the variation of density of bear populations across the landscape. Detection probability is also an integral part of SECR models which incorporates the variability of detection of individual animals within a population.
  - SECR with hair corrals is currently being utilized in Virginia as part of the Bear Mange Study across both the mange affected study area and the control area.

Hair corral grids ( 150 in year 1, 162 for years 2 and 3) were deployed in year 1 of the project and will run for 2 field seasons in the control area and 3 field seasons in the mange affected area.

- The pros and cons of SECR are similar to those noted above for basic mark-recapture. Pros include improved accuracy and precision of density estimates, especially for defined study areas, while cons include the high cost of scaling up this type of monitoring to a statewide or even bear management zone scale on a routine basis. As noted for mark-recapture estimates provided are for those single points in time (year(s) that data was collected) and additional collection will have to occur to continue to provide data for these efforts. While it would not be practical to apply SECR statewide yearly, some states rotate sample efforts across bear management units over multiple years, with a 5- or 10-year return interval often cited for rerunning sampling and analysis.

- **Additional Bear Monitoring Metrics:**

- In conjunction with harvest data other metrics can be collected to aid in population assessment. None of the below metrics alone can provide population estimates but can contribute to integrated models or overall knowledge of bear status within a state or defined management unit.
  - Bear Vehicle Collision Data
  - Agricultural Damage/Depredation Permits
  - Bear Conflict Reports
  - Disease Reports
- Virginia utilizes all the above metrics when assessing bear population objectives and biennial regulation amendments to bear harvest seasons. Data quality for each of these metrics often varies depending on how it was collected (e.g., citizen reports, staff reports, partner agency reports).

## **Glossary of Terms and Acronyms**

**Direct transmission:** Disease transmission that occurs from direct contact between two individuals

**Indirect transmission:** Disease transmission between two individuals through a contaminated reservoir, fomite, or environment

**Density-dependent transmission:** Occurs when contact rates that drive disease transmission increase when the density of the population increases

**Frequency-dependent transmission:** Occurs when contact rates that drive disease transmission remain constant regardless of the density of the population

**Sympatric hosts:** Related species in the same geographic area that host the same parasitic species

**Epizootic:** A drastic or sudden increase in the number of cases of infectious disease in an animal population

**Endemic:** A baseline level of disease activity in an affected animal population

**SCWDS:** Southeastern Cooperative Wildlife Disease Study

**WCV:** Wildlife Center of Virginia

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