Chronic Wasting Disease

Ruckelshaus INSTITUTE

A DIVISION OF THE
HAUB SCHOOL OF ENVIRONMENT AND NATURAL RESOURCES

Wyoming Game and Fish Department

Chronic Wasting Disease
Collaborative State Process

Public Workshop 1 of 2
May/June 2019

Jessica Western, Ph.D.

CHRONIC WASTING DISEASE (CWD) COLLABORATIVE PROCESS

- CWD prevalent across Wyoming
- Affects cervids: white tail and mule deer, elk and moose.
- A "wicked" situation: very complex, deep public concern and high levels of uncertainty.
- A subject of common concern.

PURPOSE OF CWD COLLABORATIVE PROCESS

- To explore CWD scientific information, cervid management, and public input to evaluate management options to minimize CWD in Wyoming's cervid populations. The Working Group will create recommendations to the Department for incorporation into a revised CWD management plan (version 3) based on meaningful public input and science.

COLLABORATION AND COLLABORATIVE LEARNING

A process in which interdependent parties work together to affect the future of an issue of shared interests.

- Issue based, not Position based.
- No one party can find a solution, all parties have to create a common understanding and find solutions with WGFD.
- To Collaborate: to work together. Collaborative Learning: to learn together.
- FOTE: Full, Open and Transparent Exchange.
- Equal access to information, allowing solutions to emerge that otherwise could not.
- Stresses improvement rather than solution, keep working together after the third CWD Plan is created.
- A time for interrelated rather than linear thinking.

Meeting #	Meeting Time and Location	Purpose	Outcomes
1. Internal Meeting	April 25, 2019	Discuss collaborative process. Introduce collaboration and collaborative process. Discuss roles and responsibilities. Discuss timeline and objectives.	Get all relevant staff on the same page regarding the collaborative process.
2 Public Workshops	Laramie May 28 Casper May 29 Sheridan May 30 Worland June 3 Pinedale June 4	Introduce collaborative process. Provide information overview re. CWD. Put all issues and interests on the table.	All the interests and issues will be listed, compiled and categorized for use in Steps 3.
3 CWD Working Group	Lander July 23-25 Casper Aug 20-22 Lander Sept 10-12	Determine levels of certainty and uncertainty related to information and data regarding CWD. Review existing management plan and draft changes and new/altered management options.	List of actions grounded in public recommendations and science that are considered to have the most potential to reduce prevalence of CWD. To be used in Step 4.
	WGFD Internal Review		
3 Public Workshops	Pinedale Dec 2 Worland Dec 3 Laramie Dec 10 Casper Dec 11 Sheridan Dec 12	Present Draft Plan to the public for input, discussion and refinement where possible.	Last changes for Working Group to consider for the revised Plan.
4 CWD	Casper Feb 5	Finalize the Plan.	Final revised CWD

FACTORS TO BEAR IN MIND

- The purpose of this process is to learn from you and the Working Group. Ultimately, if CWD is to be effectively managed in the State, WGFD needs to be able to experiment.
- Experimentation and implementation is most likely going to be a long-term proposition.
- In return, WGFD wants you to be able to learn what they can and cannot do and why.
- The recommendations that result will be taken into serious consideration by WGFD and be implemented, depending on budgets, staffing, resources, timing and many other factors. WGFD is the final decision maker.
- Science: there are wildly differing opinions and data sets to take into consideration.
- Access to Process: if you cannot attend in person, the first workshop in Laramie is recorded and will be posted on the WGFD CWD website. There you can also provide comments and suggestions.

OBJECTIVES FOR WORKSHOP #1

- Introduce the Chronic Wasting Disease collaborative process and its purpose.
- Provide information regarding the current knowledge regarding CWD.
- Provide local information regarding CWD.
- Provide the CWD Working Group with ideas to consider in developing management options for CWD.
- Discuss next steps.

AGENDA

6:00 pm	Introductions to People and Process.	Scott Edberg/Jessica Western
6:15	Current Knowledge regarding CWD	Mary Wood & Hank Edwards
6:45	CWD Impacts to Deer	Justin Binfet
7:10	CWD Management	Mary Wood
7:20	CWD Questions	WGFD
7:35	Breakout Groups:	

- **What are ideas you would like the CWD Working Group to consider in developing management options for CWD in Wyoming?**

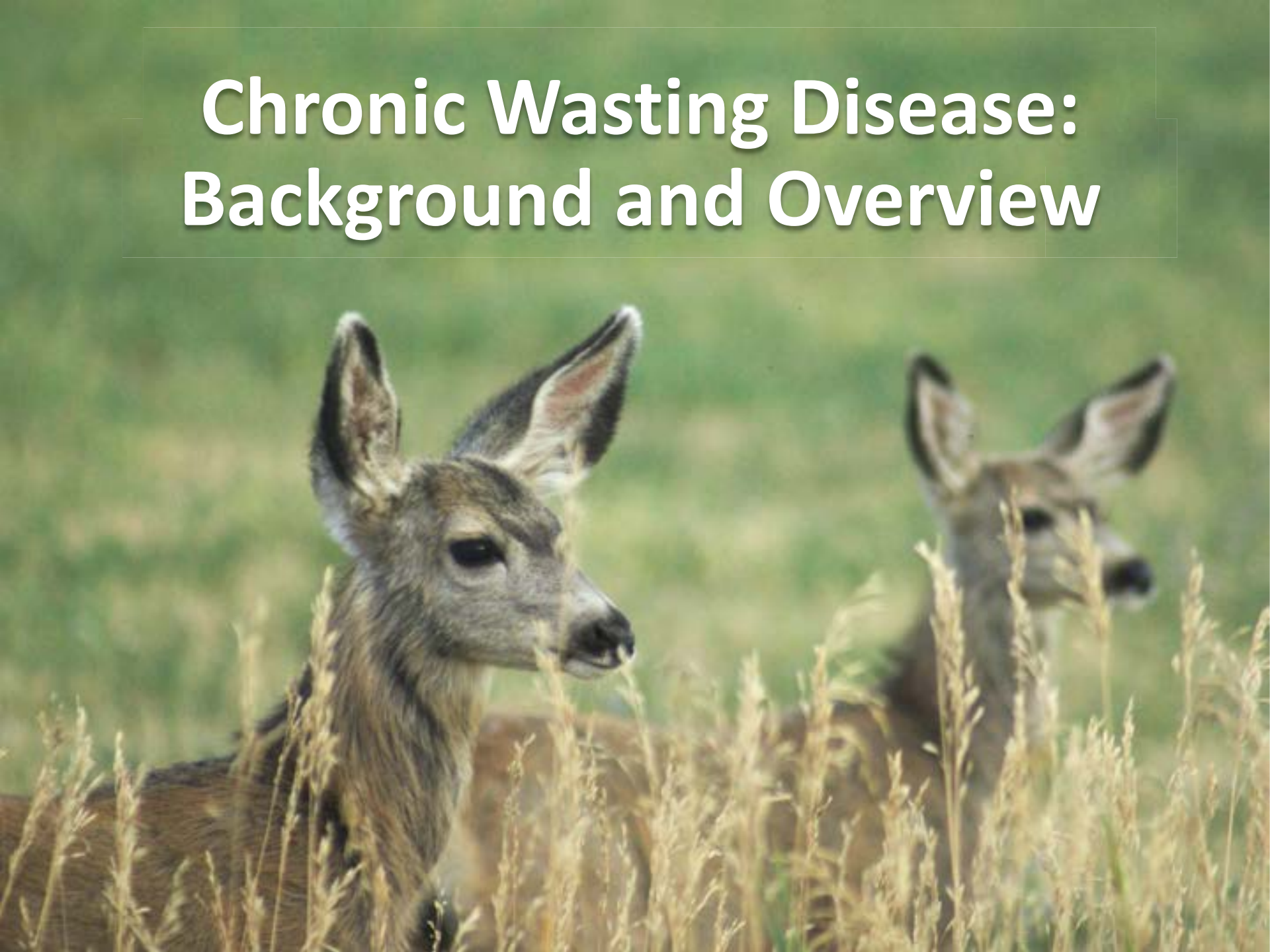
8:25	Report Back	Jessica Western
8:35	Questions and Discussion	Jessica and WGFD
8:55	Next Steps	Jessica Western
9:00	Adjourn	Scott Edberg/Jessica Western

MEETING GROUND RULES

1. **This collaborative process is about Chronic Wasting Disease generally and across the entire State**. WGFD will focus on local implementation of this process's recommendations later, including e.g. feedground issues.
2. We all have an interest in the cervid herds of Wyoming and will use respectful behavior to all.
3. It's okay to disagree.
4. We will seek to understand while seeking to be understood: ask "why?".
5. We will all participate in making this a successful collaborative learning opportunity – please don't interrupt others, dominate or withhold information.
6. We will be constructive: Discuss less what does not work and more what we think will work.
7. Side conversations are disruptive.
8. If possible, we will turn off cell phones and pagers. If we can't, we will take the call outside the room.

Questions?

Chronic Wasting Disease: Background and Overview



What Is It?

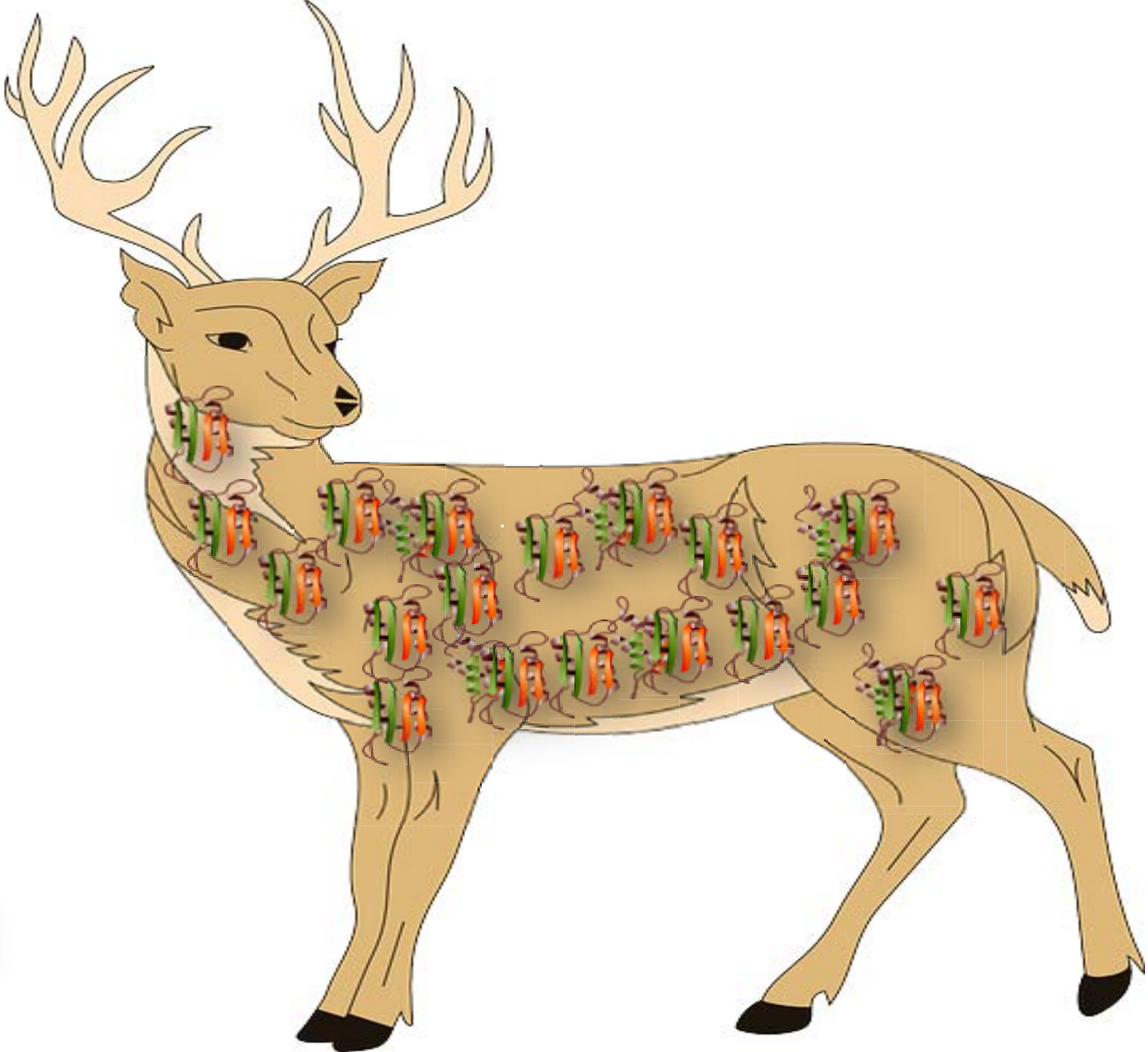
Chronic Wasting Disease (CWD) is a progressive, fatal nervous system disease of white-tailed deer, mule deer, elk, moose, and reindeer.

Causative agent: Prion (infectious protein)

Prion Simplified

Normal Protein

Abnormal Prion Protein



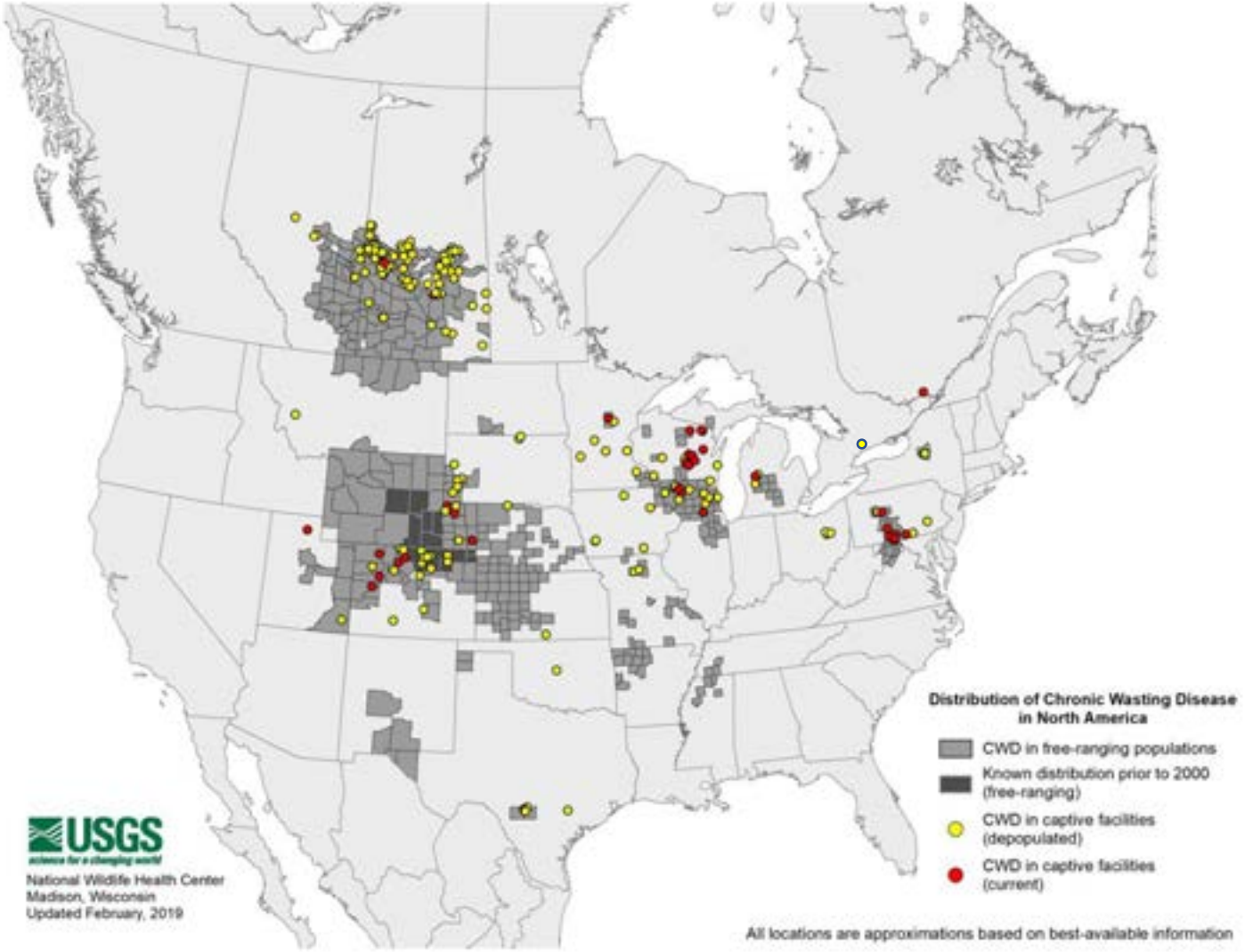
Distribution of CWD

South Korea - 2000

Norway - 2016

Finland - 2018

Sweden - 2019



Clinical Signs

No clinical signs until very late stage disease

- Weight loss
- Drooling
- Behavioral changes
- Hair/coat changes
- Droopy ears
- Lack of general awareness

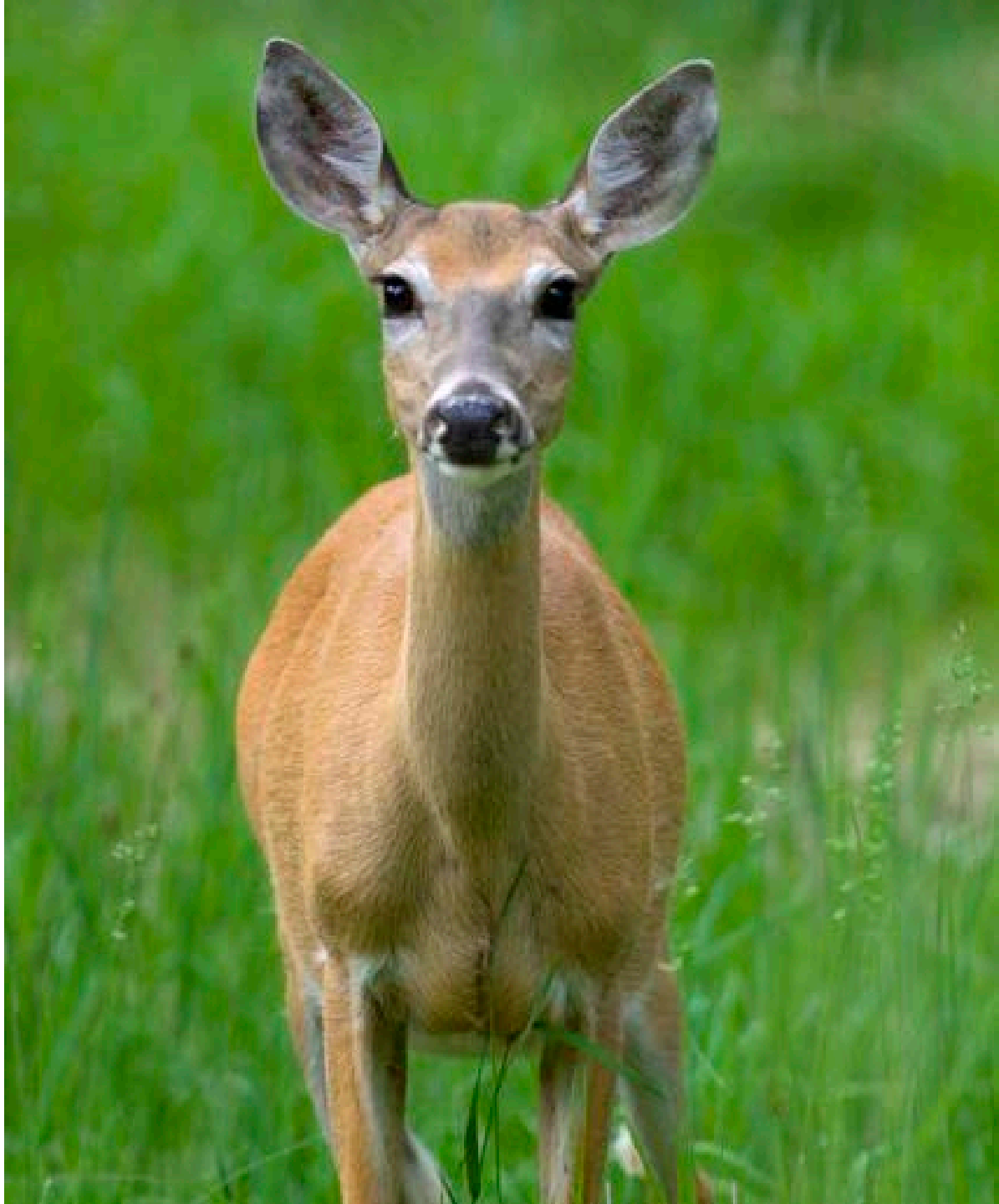
The majority of all harvested CWD positive animals appear completely normal!!

CWD Transmission

Animal to Animal

Environmental

- Ingestion with contaminated soils/plants
- Carcasses
- Saliva, urine, fecal contamination
- Contaminated surfaces
- Fences, feeders/troughs
- Mineral licks, tubs



Shedding

CWD can be shed for months to years before an animal ever shows signs of the disease.

Sex, Age, and CWD

CWD prevalence in bucks ~ higher than does.

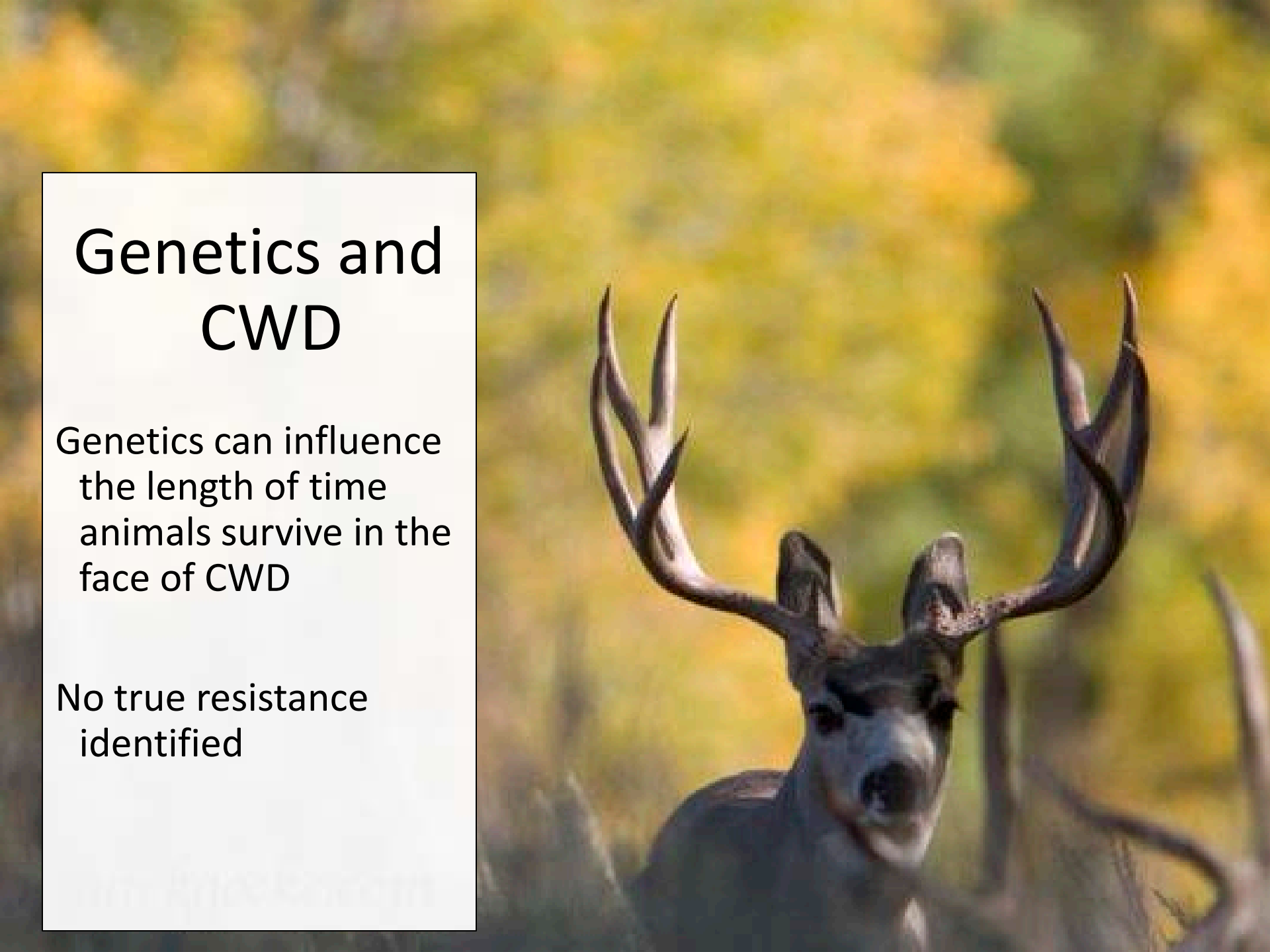
CWD prevalence in prime-aged bucks ~ higher.

No difference between sexes in elk

Genetics and CWD

Genetics can influence the length of time animals survive in the face of CWD

No true resistance identified



Prions in Plants

CWD found on plant leaves and stems

CWD taken up into roots, stems, and leaves

Plants fed to mice caused CWD

Environmental Persistance

Prions remain infectious in the environment for years to decades

Social Groups

CWD tends to be transmitted in social groups

Predators and CWD

Mountain lions selectively prey on CWD infected animals.

Modeling suggests selective wolf predation may decrease CWD prevalence.

CWD Transmission to Humans

Laboratory Studies: Substantial species barrier – not absolute.

Public Health Studies: No demonstrated link between human prion disease and ingestion of game meat.

Ongoing study reported transmission to macaques via ingestion.

Even though there is no current evidence for human illness, limiting CWD and minimizing human exposure to CWD may be prudent.

Why care about CWD?

1. CWD is a fatal disease of cervids capable of negatively impacting cervid populations, rendering them less resilient.

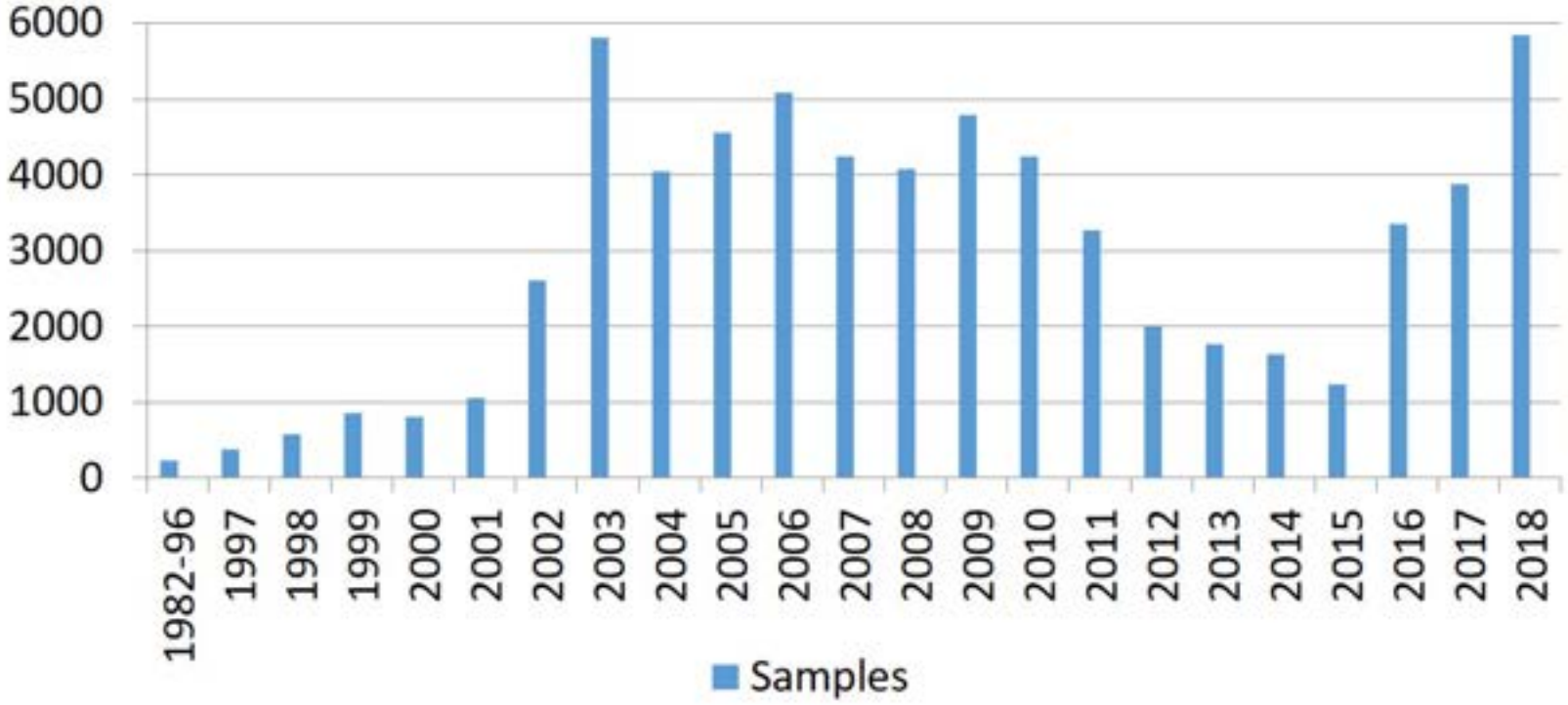
2. If allowed to progress unchecked, prion accumulation in the environment may become substantial.

3. Growing concerns about transmission to humans and increasing prevalence could erode hunting participation.

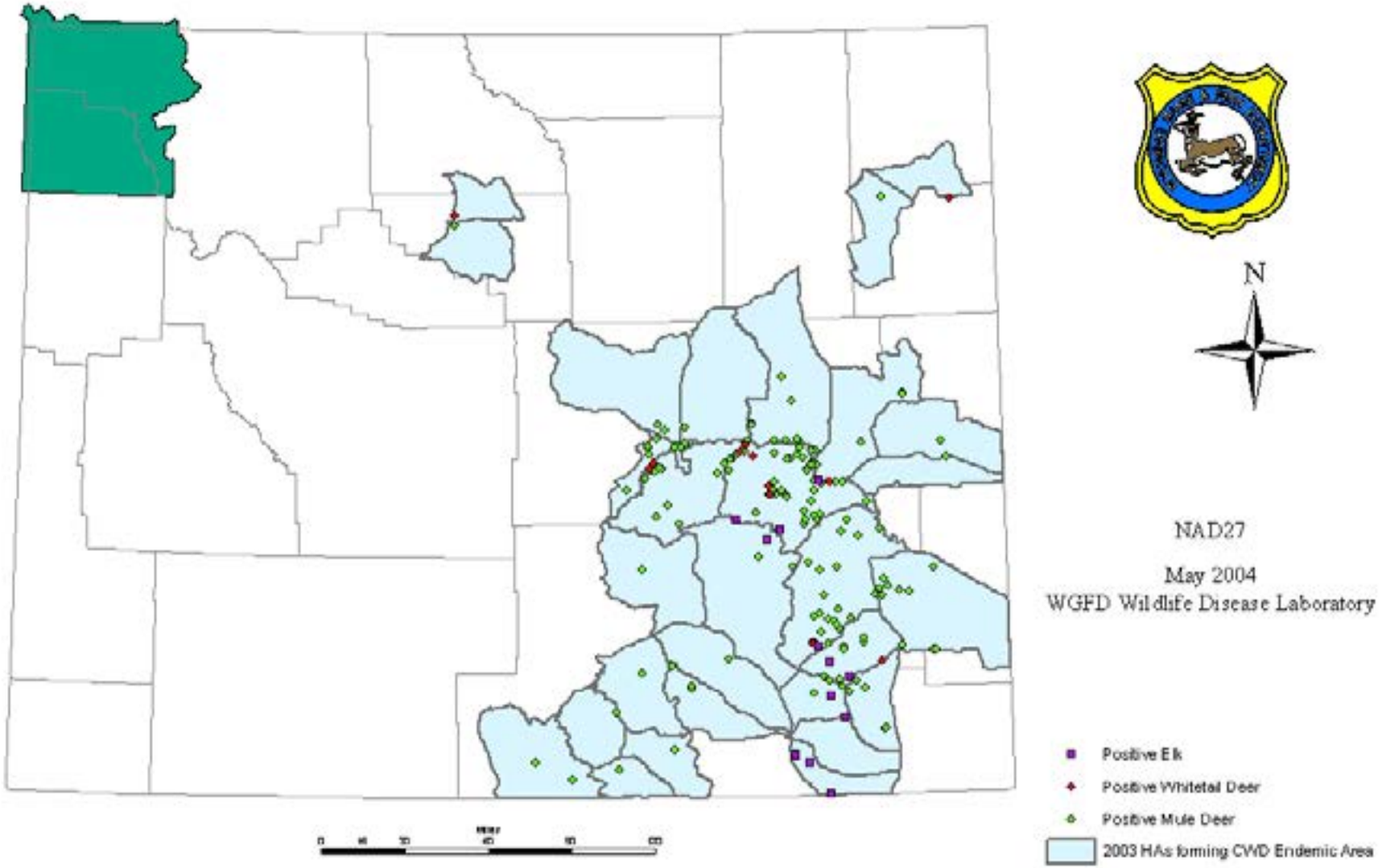
4. It is our obligation to manage for healthy, sustainable free-ranging populations.

Chronic Wasting Disease Trends in Wyoming

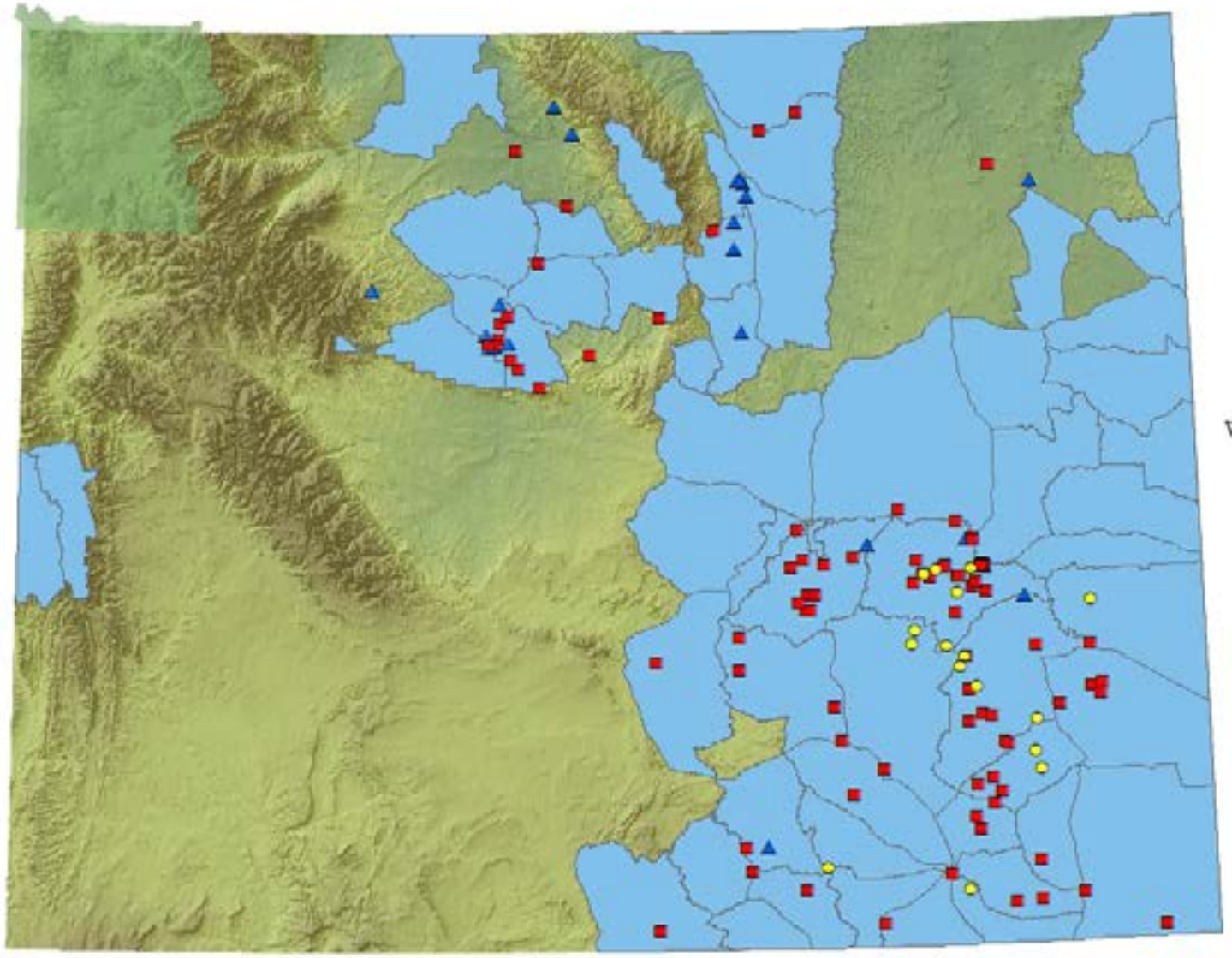
Total CWD Samples Tested By Year: 1982 To 2018



2003 Chronic Wasting Disease Test Results in Wyoming: All Positive Species



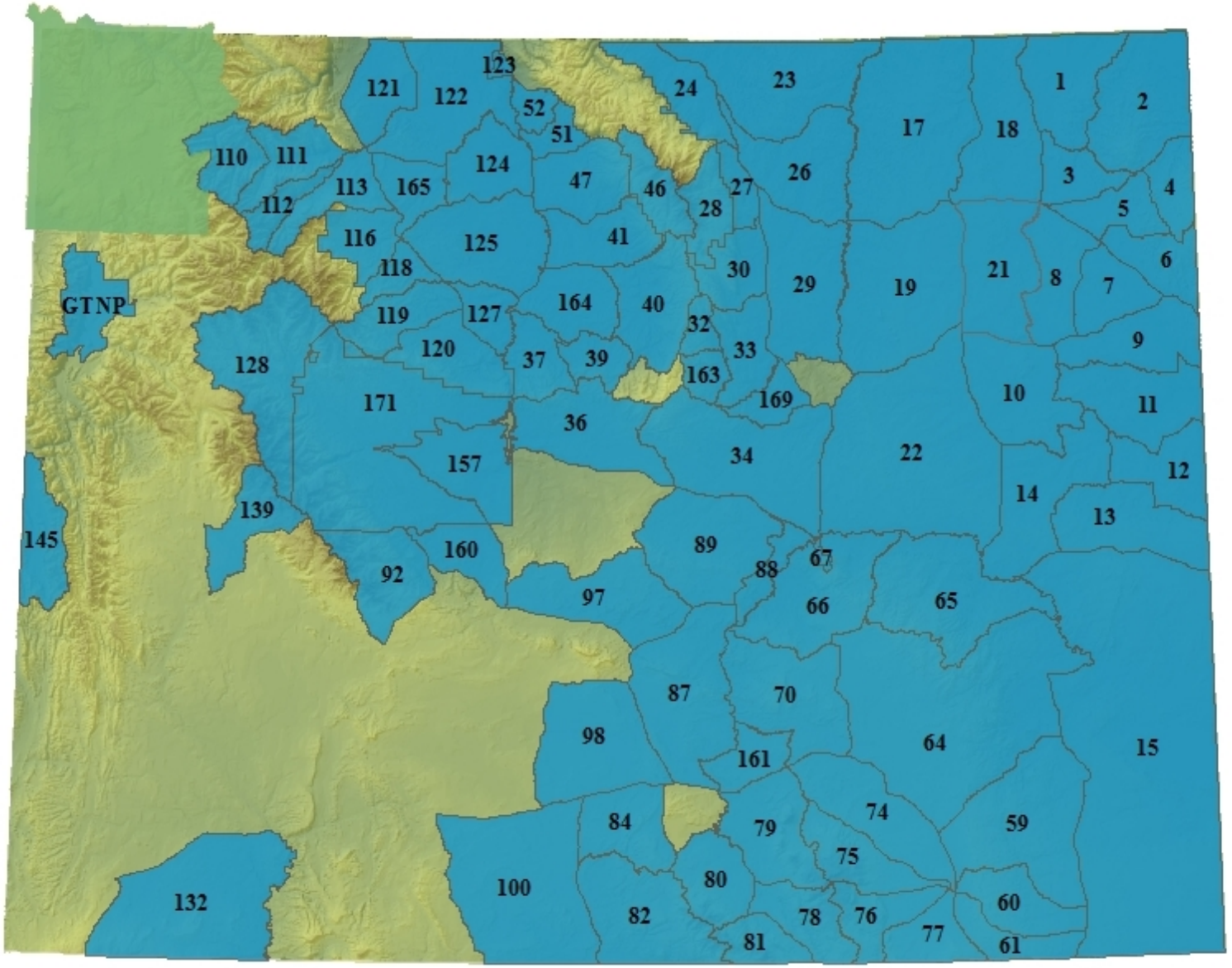
2010 Wyoming Chronic Wasting Disease Surveillance: Positives by Species



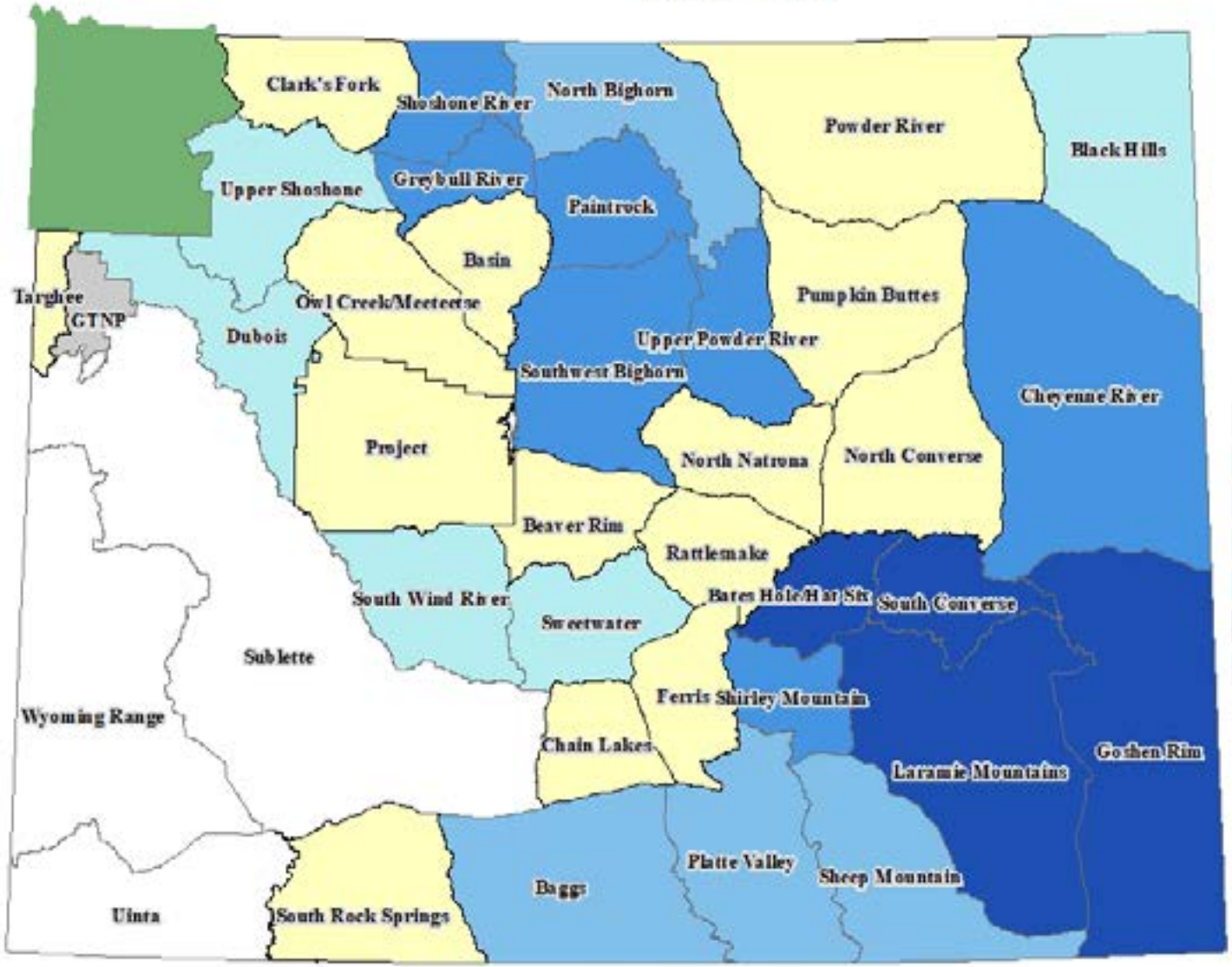
Wyoming Game and Fish Dept.
Wildlife Disease Lab
March 2011

- Pos Elk
- Pos Mule Deer
- Pos Whitetail Deer
- 2010 CWD Endemic Area

Wyoming Chronic Wasting Disease Positive Mule Deer Hunt Areas
4/17/2019



Chronic Wasting Disease (CWD) Prevalence in Hunter Harvested Adult Buck Mule Deer by Herd Unit 2014-2018



Wyoming Game and Fish Department
Wildlife Health Laboratory

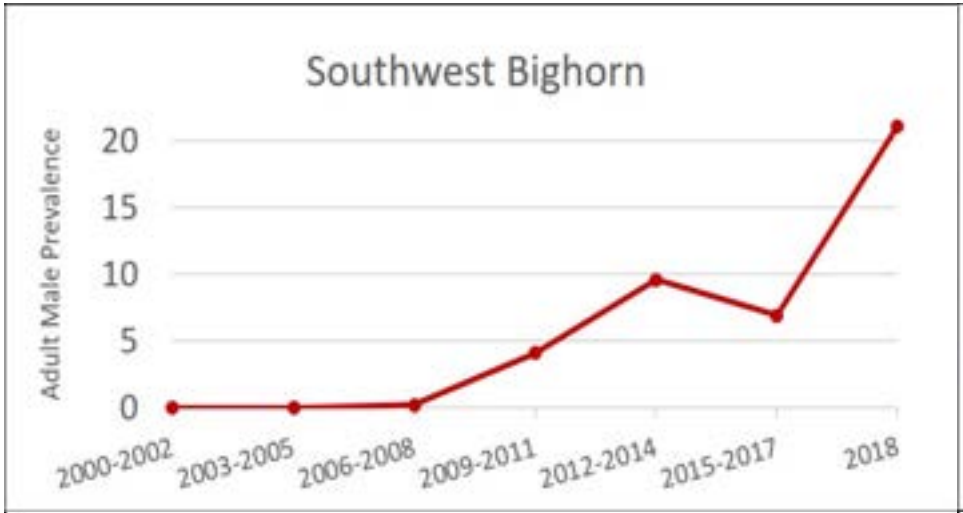
CWD Prevalence

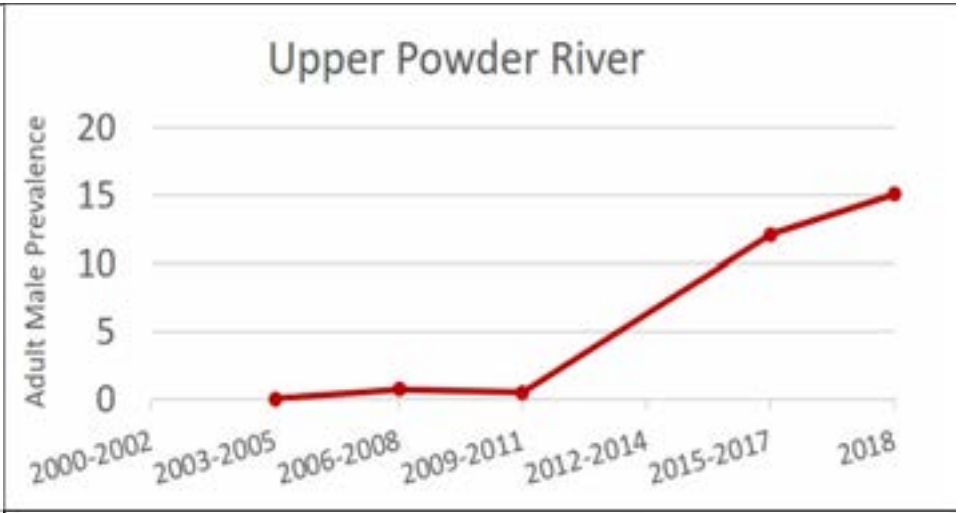
- 0%
- >0% - 5%
- >5% - 10%
- >10% - 20%
- >20%
- Insufficient Sample Size
- No Data Available

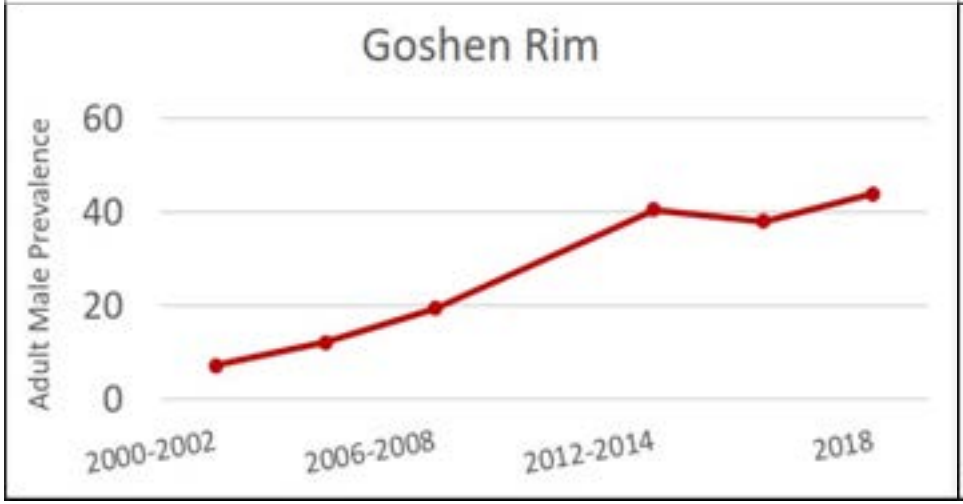
* Sample size is too low for estimation of prevalence

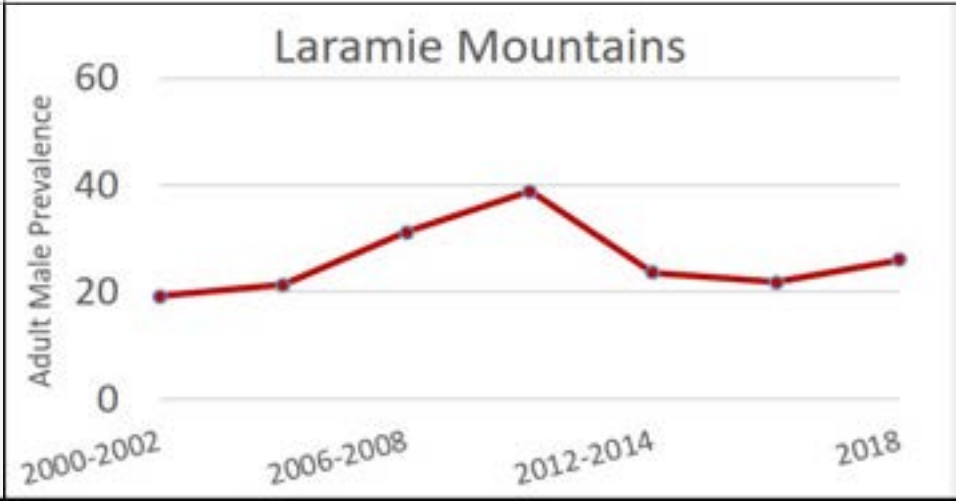
This map depicts prevalences calculated from 2014-2018 data only, see distribution map for statewide distribution of CWD

CWD Trends in Wyoming Deer Herds

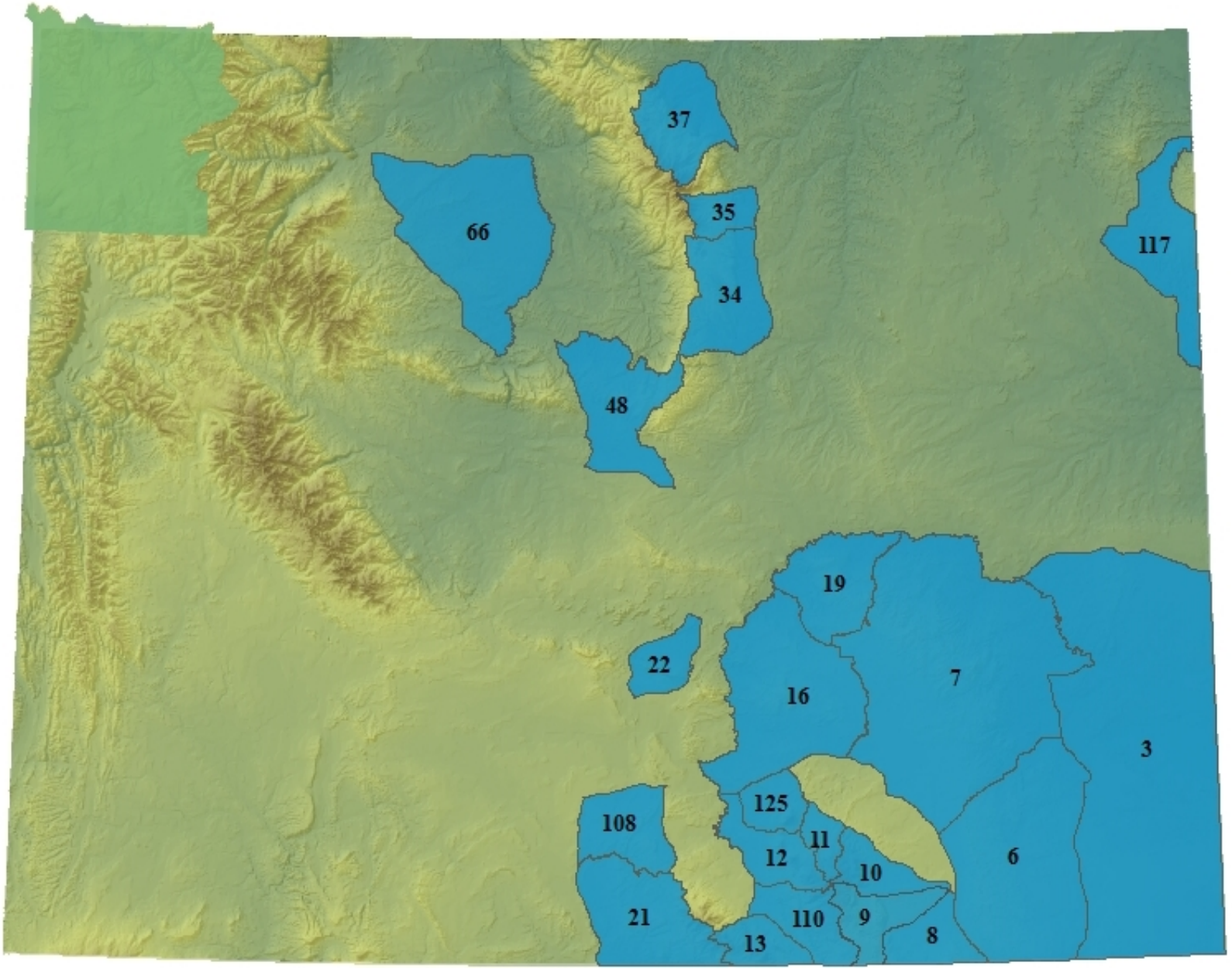




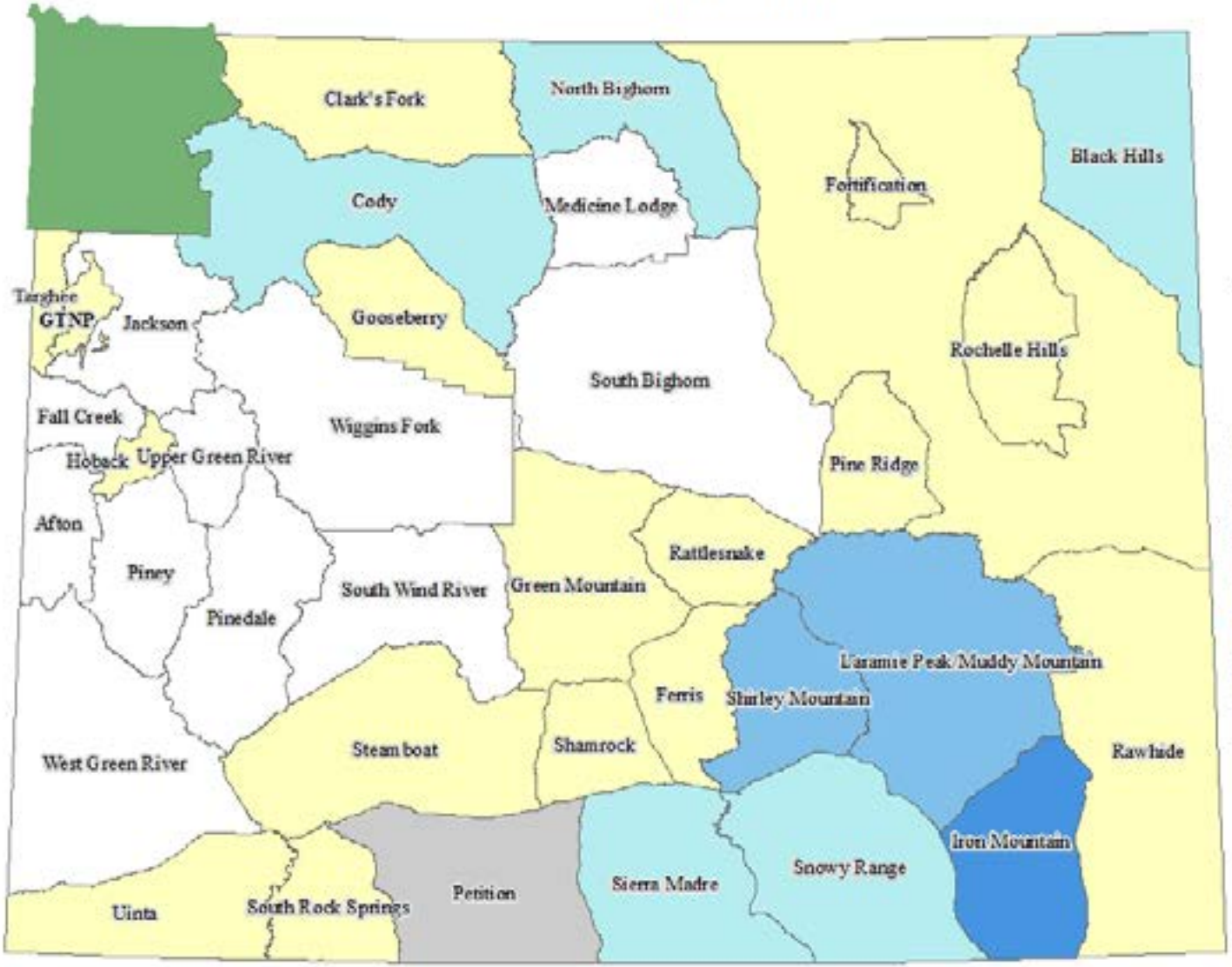




Wyoming Chronic Wasting Disease Positive Elk Hunt Areas
4/17/2019



Chronic Wasting Disease (CWD) Prevalence in Hunter Harvested Adult Elk by Herd Unit 2014-2018



Wyoming Game and Fish Department
Wildlife Health Laboratory

CWD Prevalence

- 0%
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- >10% - 20%
- >20%
- Insufficient Sample Size*
- No Data Available

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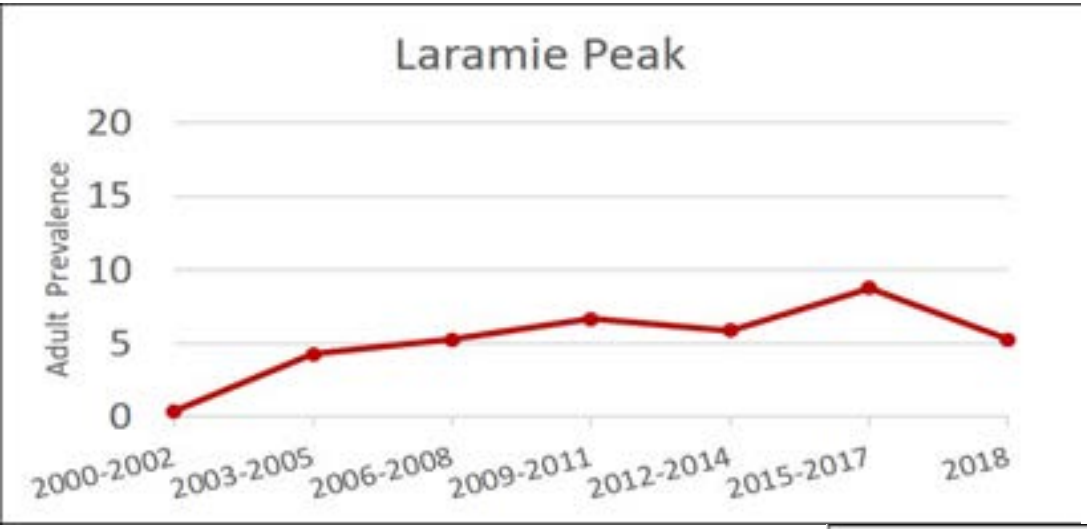
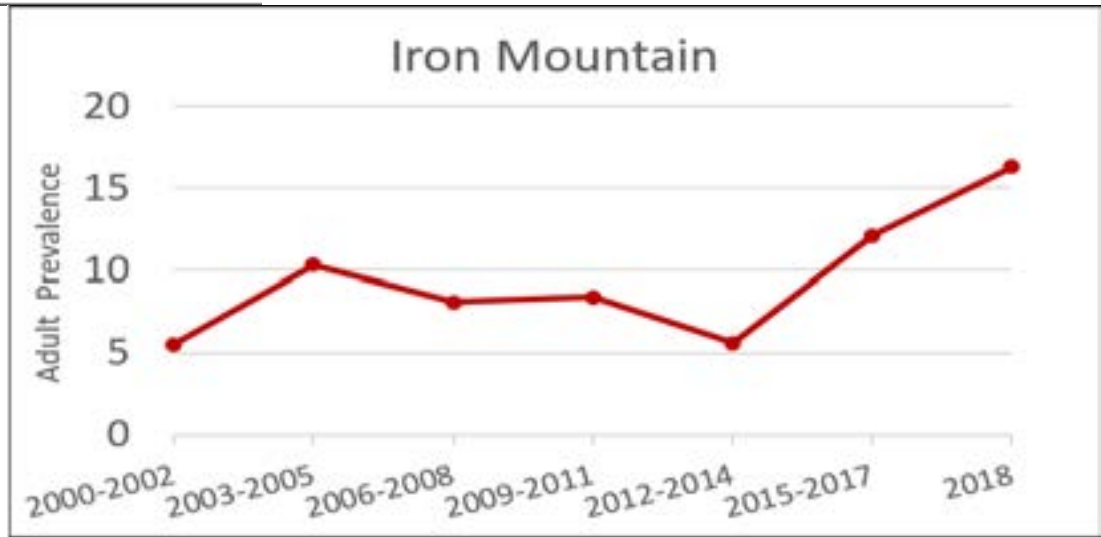
This map depicts prevalences calculated from 2014-2018 data only, see distribution map for statewide distribution of CWD

Trends in Southeastern Elk Herds





CWD and the Future

CWD will continue to increase in distribution and prevalence

- Identified in ~5 new deer areas each year
- No indication thus far of a long term trend of decreasing prevalence in any hunt area

Hunting in areas with CWD

- Don’t harvest animals that appear unusually thin or obviously sick
- Wear rubber/latex gloves when field dressing
- Quarter and freeze animal until test results are returned
- Disinfect knives for 1 hr in 50% bleach (may corrode)

Changes Coming in CWD Surveillance

- Shift in focus from detection in new areas to statewide monitoring
- Regional concentration on ~2 herd units/year
  - Emphasis on statistical significant sample sizes
- 5 year rotation for each herd unit
- CWD sample collection at Regional Offices for animals harvested outside focus herd units
- WSVL testing in 10 working days ($30)

Mule Deer Population Effects of CWD in Wyoming

- Mule deer populations can fluctuate substantially in Wyoming over time
- Factors affecting mule deer survival include:
  - Weather
  - Forage production, availability and quality (nutrition)
  - Predation
  - Habitat quantity and quality
  - Human activity
  - Competition with livestock and other wildlife
  - Disease

Weather is the largest driver of mule deer populations on an annual basis

Habitat quality and availability is the largest driver of mule deer populations over the long term

Favorable spring/summer weather – wet springs with mild temperatures and continued over-summer precipitation promoting good forage production

Leads to good nutritional body condition of adult females entering the winter, which is most important for over-winter survival, demands of pregnancy, fawn birth weights, lactation, and ultimately fawn survival for the following year

Favorable winter weather – mild winter temperatures with exposed forage

Mild winters enable ungulates to move and forage easily while reducing energetic demands of thermoregulation

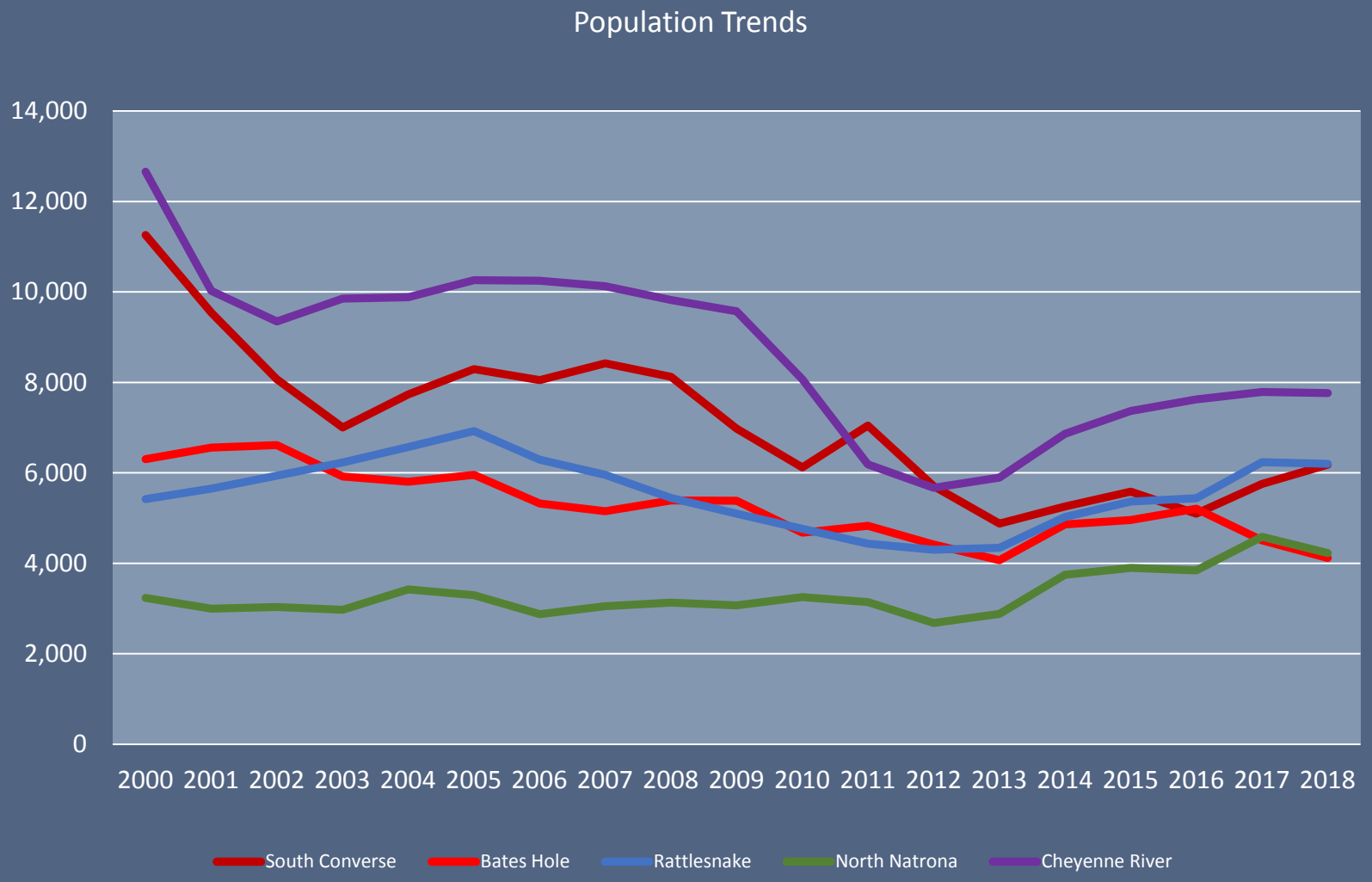
Unfavorable spring/summer weather – dry springs with prevailing summer drought and high temps reducing forage production and causing plants to cure quickly

Decreases nutritional body condition of adult females entering the winter, which can lead to lower fawn birth weights and depressed fawn survival in the following spring, while also increasing the chances of adult winter mortality

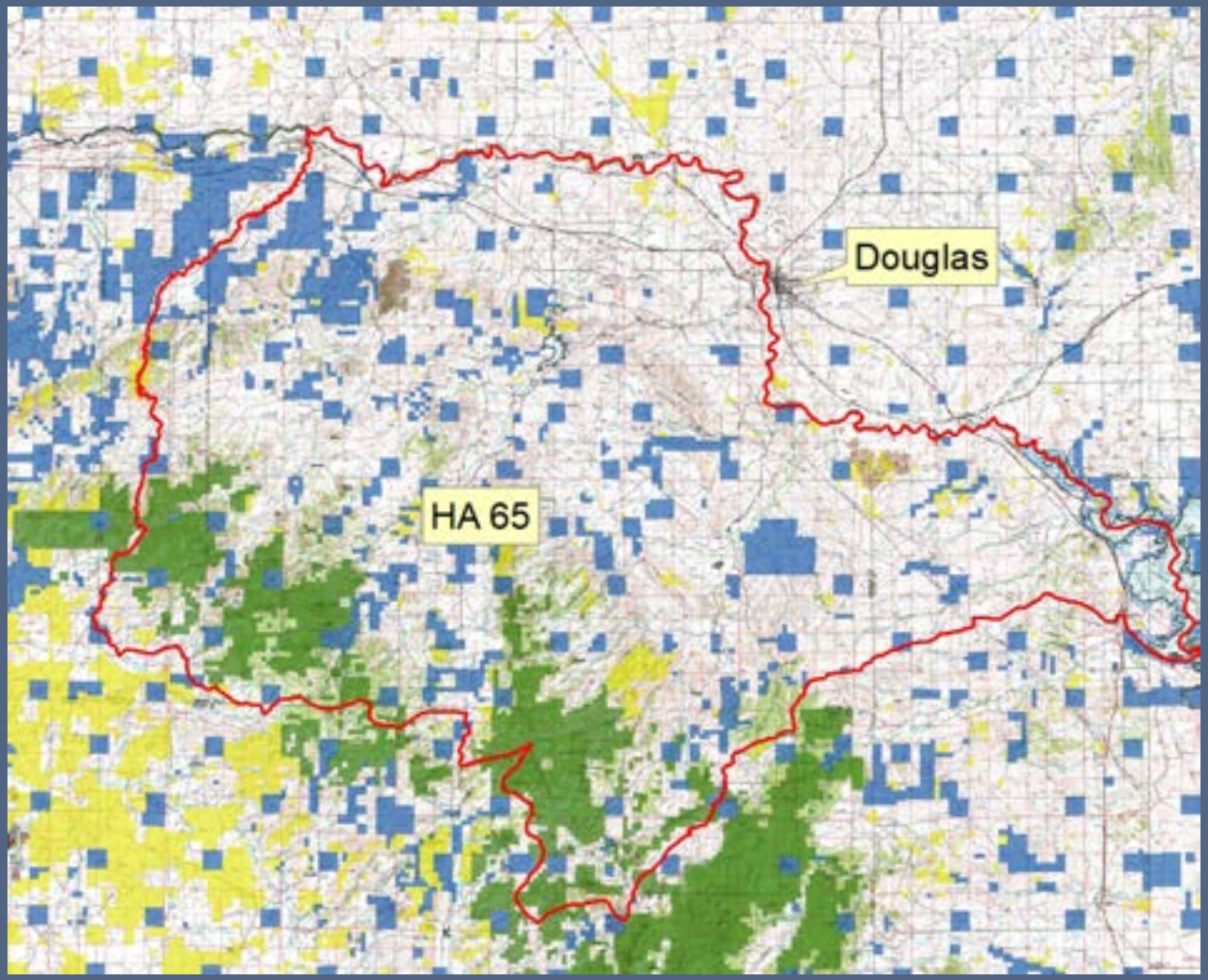
<u>Unfavorable winter weather</u> – Persistent cold winter temps with high snowpack in low-elevation winter ranges

Severe winters can lead to direct over-winter mortality on all age classes (especially fawns born the previous spring) and depressed fawn birthweights and survival the following spring

Casper Region Mule Deer Population Trends – 2000 – 2018



CWD Prevalence in 2+ Bucks – South Converse Mule Deer (HA65)



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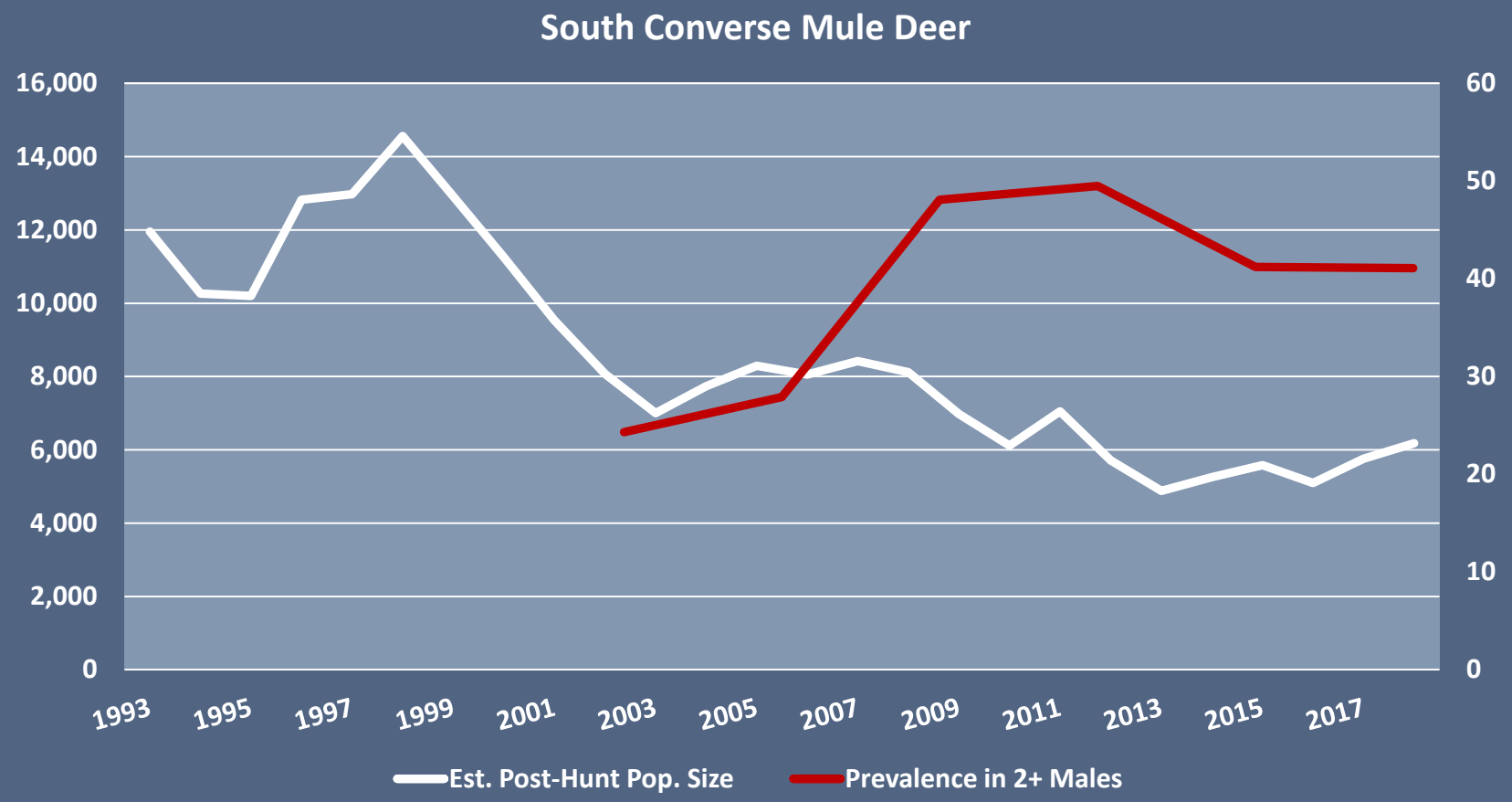
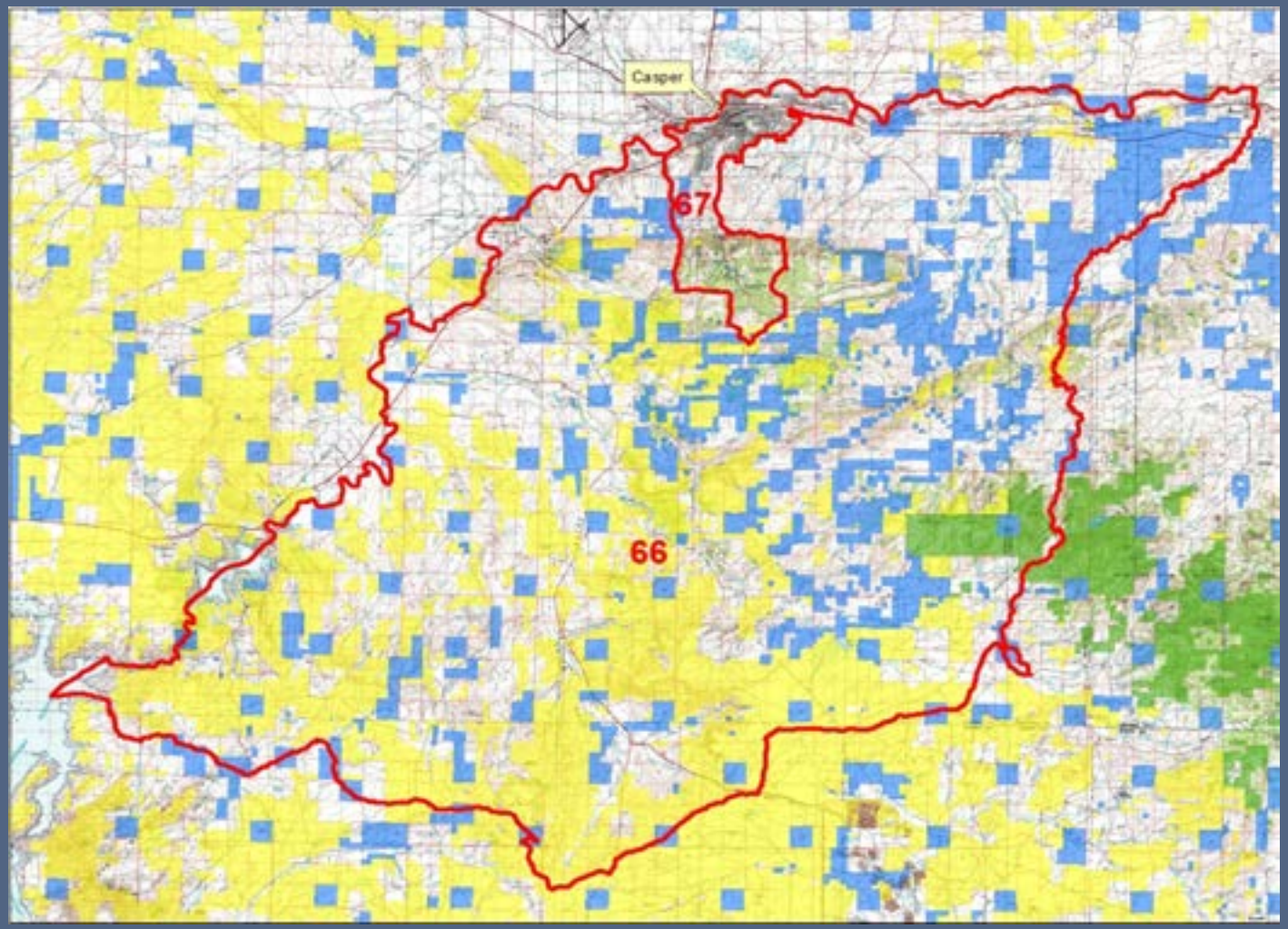


CWD Prevalence in 2+ Bucks - Bates Hole / Hat Six Mule Deer (HA66)



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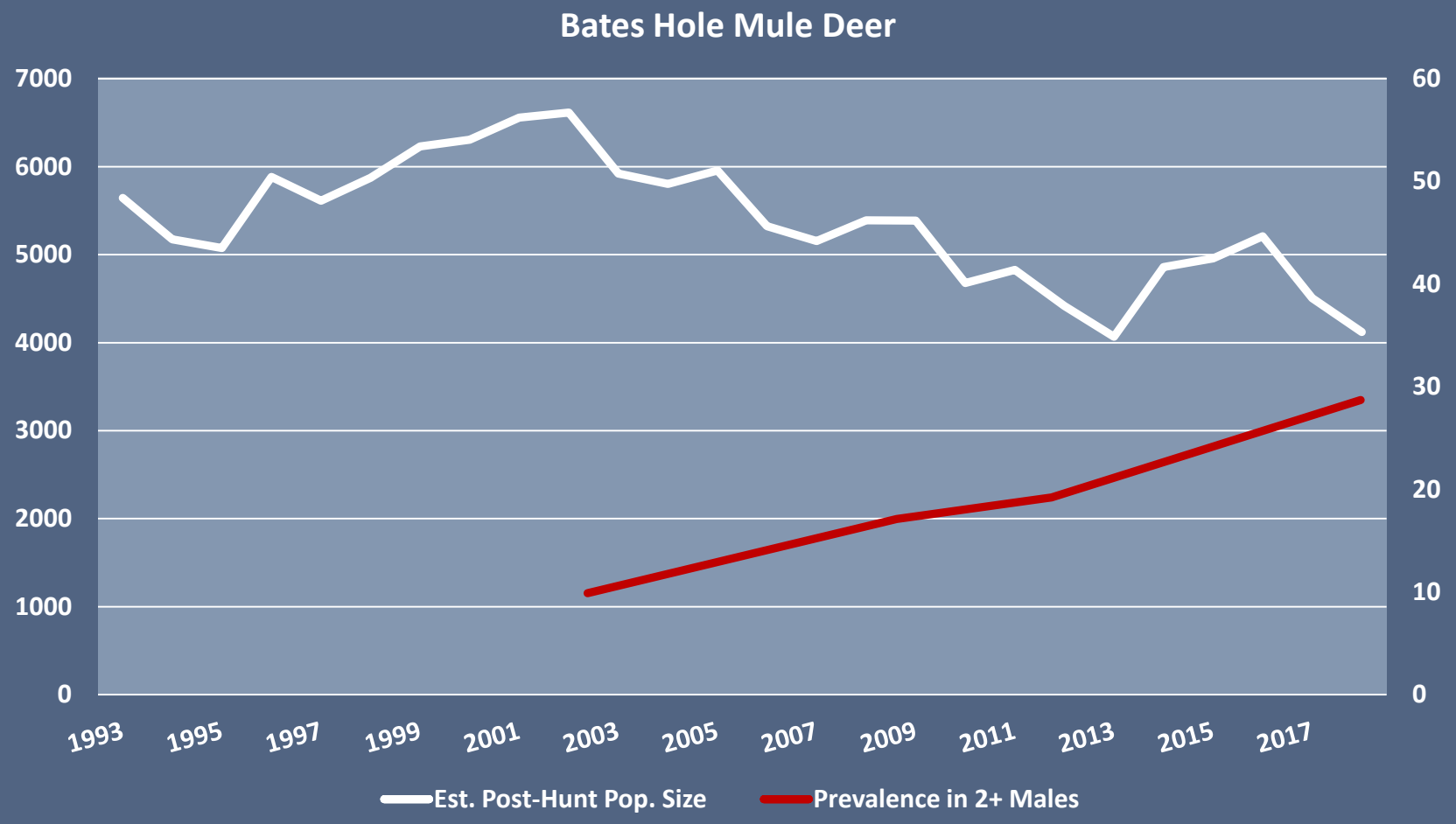


Annual Survival

Bates Hole / Hat Six Mule Deer (HA66) – Annual adult female survival from collared deer was 0.73 in 2017

South Converse Mule Deer (HA65) – Annual adult survival ranged from 0.65 – 0.73 during a 4-year CWD study

- Statewide long-term mean annual survival in Colorado is 0.82
- Survival dropped below 0.70 in only one year in one herd in Colorado since intensive monitoring began

Bates Hole / Hat Six Mule Deer Study – 2017 Data

Of the 34 collared deer in which CWD status was determined, prevalence was 29% in adult females

55 collared deer – 20 mortalities over 1.5 years

- 8 were CWD-negative at time of mortality, 11 CWD-positive, 1 unk

- 9 mountain lion kills
  - 3 CWD+, 6 CWD-
- 5 deaths from clinical CWD
- 2 highway vehicle collisions
- 2 unknown predation
- 1 capture myopathy
- 1 unknown

Additive or Compensatory Mortality?

Some level of mortality will always occur in a wildlife population

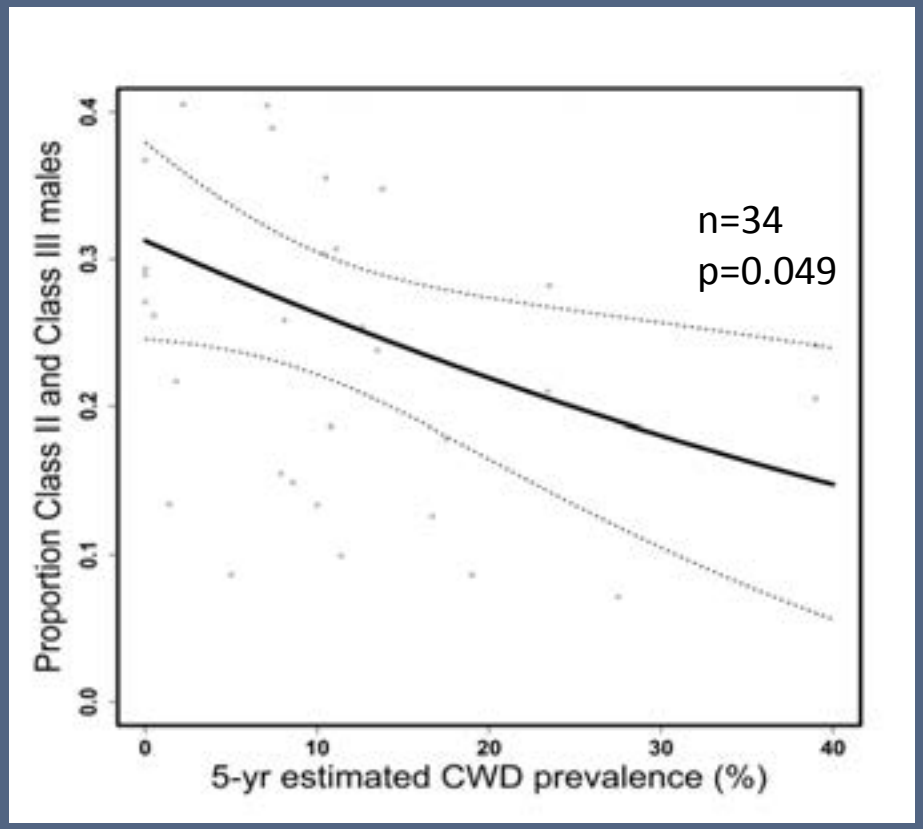
Compensatory Mortality – mortality (weather, hunting, predation, disease, highway collisions, etc.) is spread out across the segment of a population that would have died regardless

- Does not affect overall population performance

Additive Mortality – decreases survival in a wildlife population

- Additive sources of mortality cause deaths above what would be expected from normal environmental processes
- Disease occurs throughout most wildlife populations with varying levels of severity/impact
  - Deaths from CWD are likely compensatory at low CWD prevalence, but become increasingly additive at higher prevalence

9% of all collared deer in 2017


Proportion Class II and Class III males
0.0
0.1
0.2
0.3
0.4
0
10
20
30
40
5-yr estimated CWD prevalence (%)
n=34
p=0.049

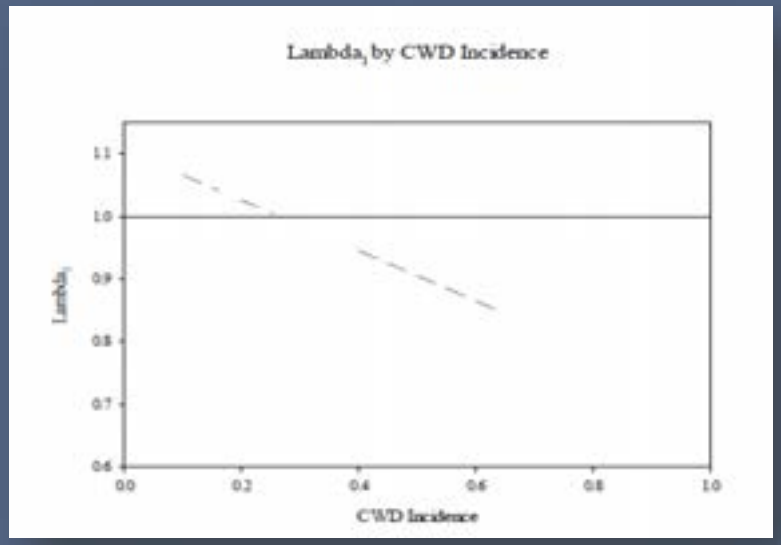
In 2018, CWD prevalence was 26% (N=19) in yearling bucks in Bates Hole / Hat Six Mule Deer

- Likely a sign of high CWD prevalence in adult females
- May be additive source of male mortality
- Hunting season structure implications

Mule Deer Population Effects of CWD Wyoming

White-tailed deer study: 10% annual pop decline at ~30% CWD prevalence

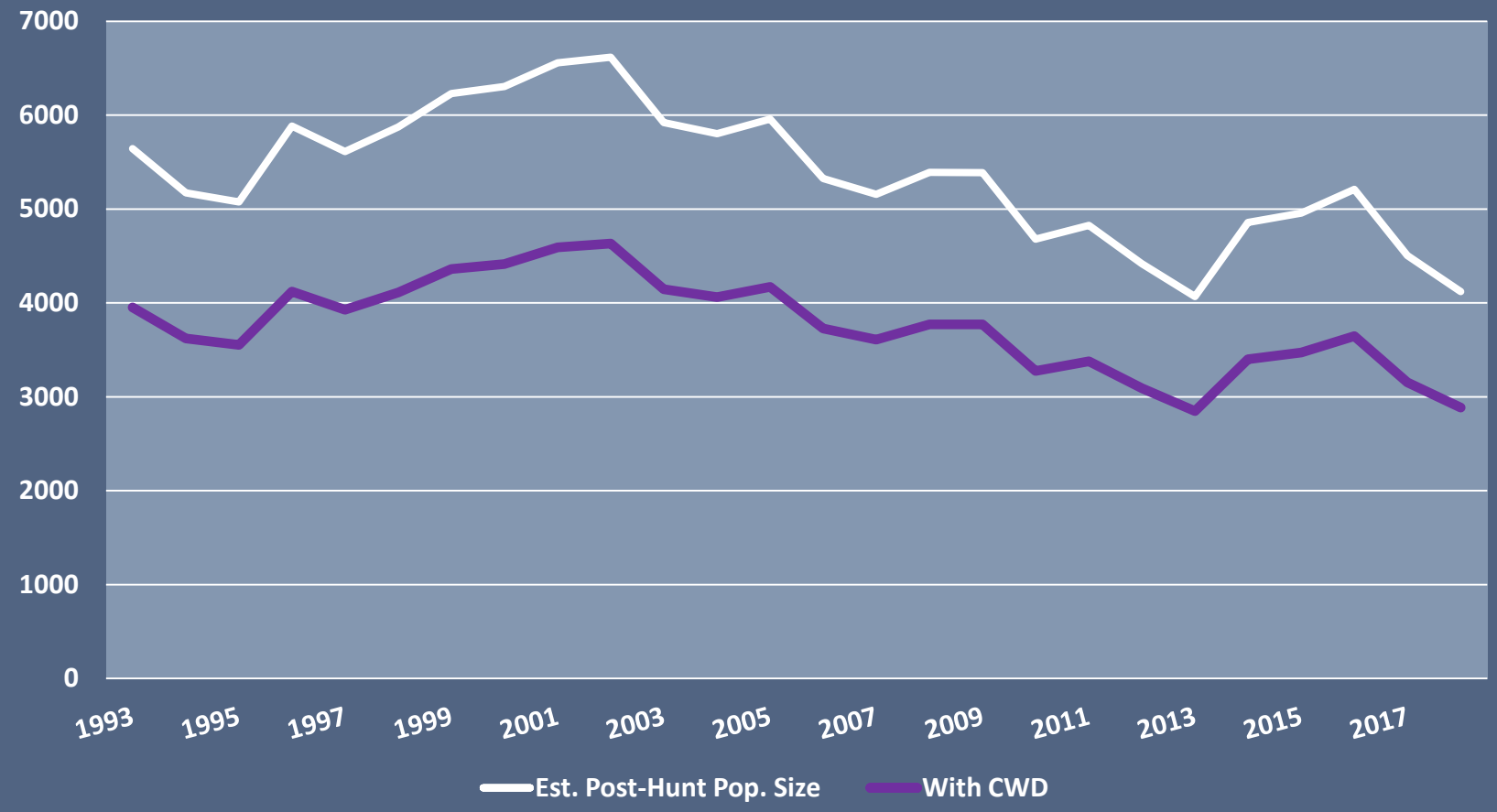
Recent mule deer study: 19% annual decline at ~40% prevalence and genetic shift



Edmunds, David R. Chronic wasting disease ecology and epidemiology of white-tailed deer in Wyoming. University of Wyoming, 2013.

DeVivo, Melia T. Chronic Wasting Disease Ecology and Epidemiology of Mule Deer in Wyoming. University of Wyoming, 2015.

CWD Over the Long Term



Take Away Messages

CWD is a significant deer management concern

CWD is causing mule deer population decline in Wyoming

CWD effects on deer are ***additive*** at high prevalence

Chronic Wasting Disease Management:

What's been tried and what is recommended

Eradication

Minnesota and New York

Strategy:

Early and aggressive intervention of point source introductions. Population reduction through hunting and/or culling.

Outcome:

Apparently successful in eliminating CWD, but new cases identified in MN in 2016.

Wisconsin

Strategy:

Large-scale increased hunting combined with culling to eradicate.

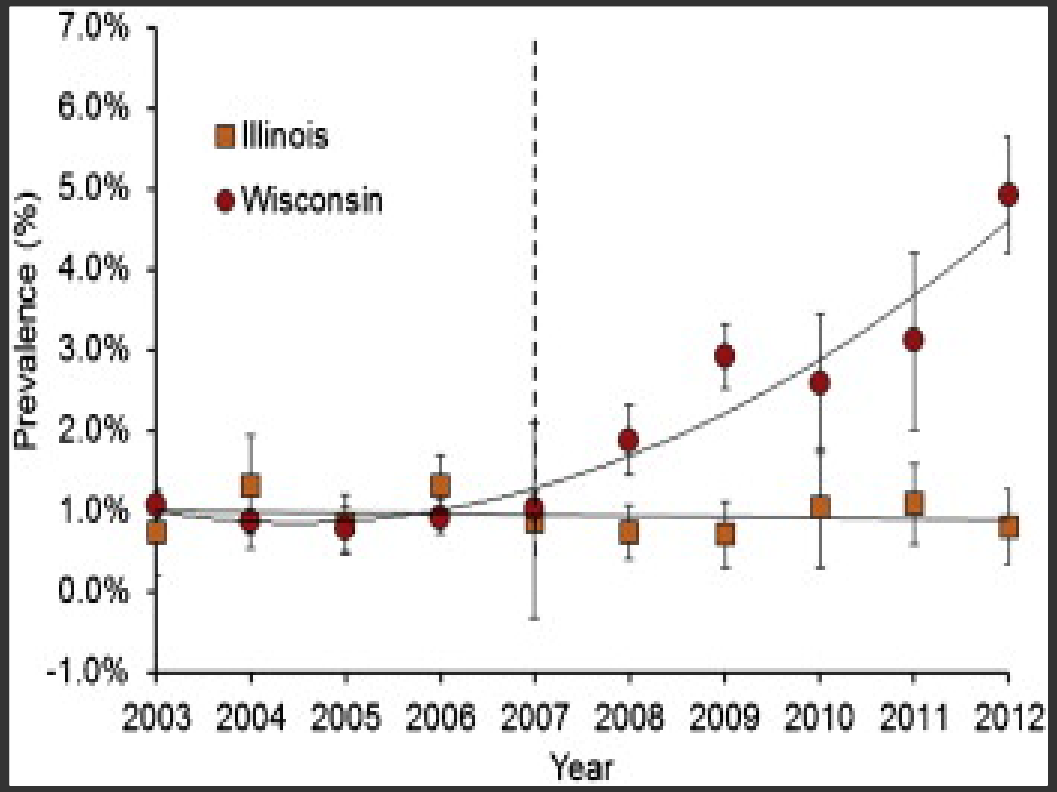
Outcome:

Unable to eradicate

- Discovered disease was far more established than expected

Ultimately not sustainable and intolerable by public

Focused Density Reduction



Illinois

Strategy:

Early reduction followed by prolonged selective culling and moderate hunting changes.

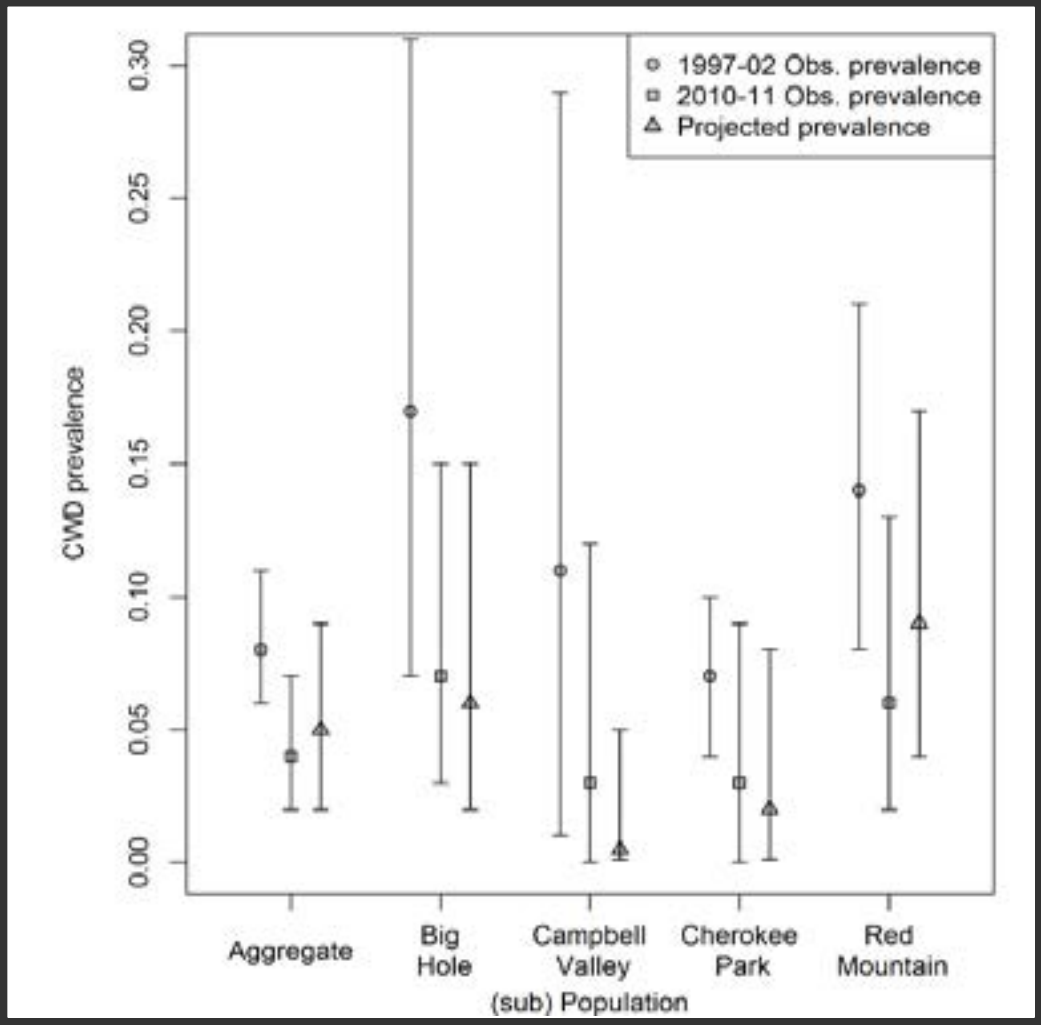
Outcome:

Able to maintain low (1-3%) prevalence and minimize spread.

Mateus-Pinilla, Nohra, et al. "Evaluation of a wild white-tailed deer population management program for controlling chronic wasting disease in Illinois, 2003–2008." Preventive veterinary medicine 110.3 (2013): 541-548.

Manjerovic, Mary Beth, et al. "The importance of localized culling in stabilizing chronic wasting disease prevalence in white-tailed deer populations." Preventive veterinary medicine113.1 (2014): 139-145.

Non-specific Density Reduction



Colorado

Strategy:

Density Reduction: drop population by 25% through harvest and culling and maintain.

Outcome:

Abandoned due to lack of early, measurable results

10 years later – CWD prevalence reduced.

Geremia, Chris, et al. "Bayesian Modeling of Prion Disease Dynamics in Mule Deer Using Population Monitoring and Capture-Recapture Data." PloS one 10.10 (2015): e0140687.

Conner, Mary M., et al. "A meta-baci approach for evaluating management intervention on chronic wasting disease in mule deer." Ecological Applications 17.1 (2007): 140-153.

Test and Cull

Colorado

Strategy:

Tested ~ 50% of select population annually and removed positives.

Sustained for 5 years.

Outcome:

Trend toward reduced prevalence in males but not females.

Time and cost prohibitive.

Wolfe, L. L., Miller, M. W., & Williams, E. S. (2004). Feasibility of "test-and-cull" for managing chronic wasting disease in urban mule deer. *Wildlife Society Bulletin*, *32*(2), 500-505.

Wolfe, L. L., Watry, M. K., Sirochman, M. A., Sirochman, T. M., & Miller, M. W. (2018). EVALUATION OF A TEST AND CULL STRATEGY FOR REDUCING PREVALENCE OF CHRONIC WASTING DISEASE IN MULE DEER (ODOCOILEUS HEMIONUS). Journal of wildlife diseases, 54(3), 511-519.

Targeted Reduction of Density/Disease Foci

Alberta

Strategy:

Identify infected deer through fall hunter surveillance followed by winter removal and density reduction.

Outcome:

Unable to eliminate spread – but appeared to minimize spread and minimize increases in prevalence.

Program suspended in 2009.

Pybus, MJ. (2012). CWD Program Review 2012. Alberta sustainable resource development, Fish and wildlife division. https://open.alberta.ca/dataset/f8adbf7d-14ce-4ba8-bc23-98f11e0f94f0/resource/f54d0e01-f843-49db-b385-fde89a942b00/download/2012-cwd-programreview-may-2012.pdf

Modeling Exercises

Potapov, Alex, et al. "Chronic wasting disease: transmission mechanisms and the possibility of harvest management." PloS one 11.3 (2016): e0151039.

Jennelle, Christopher S., et al. "Transmission of chronic wasting disease in Wisconsin white-tailed deer: implications for disease spread and management." PLoS One 9.3 (2014): e91043.

Al-Arydah, M., et al. "Applications of mathematical modeling in managing the spread of chronic wasting disease (CWD) in wild deer under alternative harvesting scenarios." Journal of Toxicology and Environmental Health, Part A 79.16-17 (2016): 690-699.

Wild, Margaret A., et al. "The role of predation in disease control: a comparison of selective and nonselective removal on prion disease dynamics in deer." Journal of Wildlife Diseases 47.1 (2011): 78-93.

Wasserberg, Gideon, et al. "Host culling as an adaptive management tool for chronic wasting disease in white-tailed deer: a modelling study." Journal of Applied Ecology 46.2 (2009): 457-466.

Management Recommendations

AFWA Best Management Practices

https://www.fishwildlife.org/application/files/9615/3729/1513/AFWA_Technical_Report_on_CWD_BMPs_FINAL.pdf

- Regulate movement/disposal of carcasses
- Prohibit live cervid movement
- Prohibit products that include natural urine, feces or other items of cervid origin
- Restrict feeding and baiting of cervids
- Strategic surveillance/monitoring considering sample sizes
- Management: WAFWA Adaptive Management

Recommendations for Adaptive Management of Chronic Wasting Disease in the West

Adaptive Management

A systematic approach for learning from management outcomes over time.

Strategic application and evaluation of experimental CWD suppression strategies.

Systematic, hypothesis-based, and scientific approach.

Minimum application of 5-10 years

Harvest Management

Hypothesis: Increasing harvest on the population segment most likely to be CWD positive will reduce prevalence.

Hypothesis: Harvesting males later in the season will reduce prevalence.

Goal: Increase harvest, bias harvest toward infected males, shift harvest timing. Consider female harvest in high prevalence areas.

Harvest Targeting Disease Foci

Hypothesis: Selectively removing animals in concentrated areas where CWD occurs will reduce prevalence.

Goal: Build on harvest or other surveillance programs to maximize removal of infected individuals and reduce rate of new infections.

Reduce Artificial Points of Host Concentration

Hypothesis: Reducing artificial concentration will reduce environmental contamination and transmission.

Goal: Identify and mitigate artificial point sources of food, minerals, water causing aggregation of cervids.

Moving Forward

Several CWD management attempts have shown promise, but were prematurely terminated.

Future management must include realistic goals, long-term application, public support.

Initial management will be experimental and adaptive.

We did not get here overnight and we will not fix it overnight.

Questions?