Elk Hoof Disease in Southwest Washington

June 7-8, 2013
WDFW Commission Meeting
Presentation

Information is subject to change and amendments over time

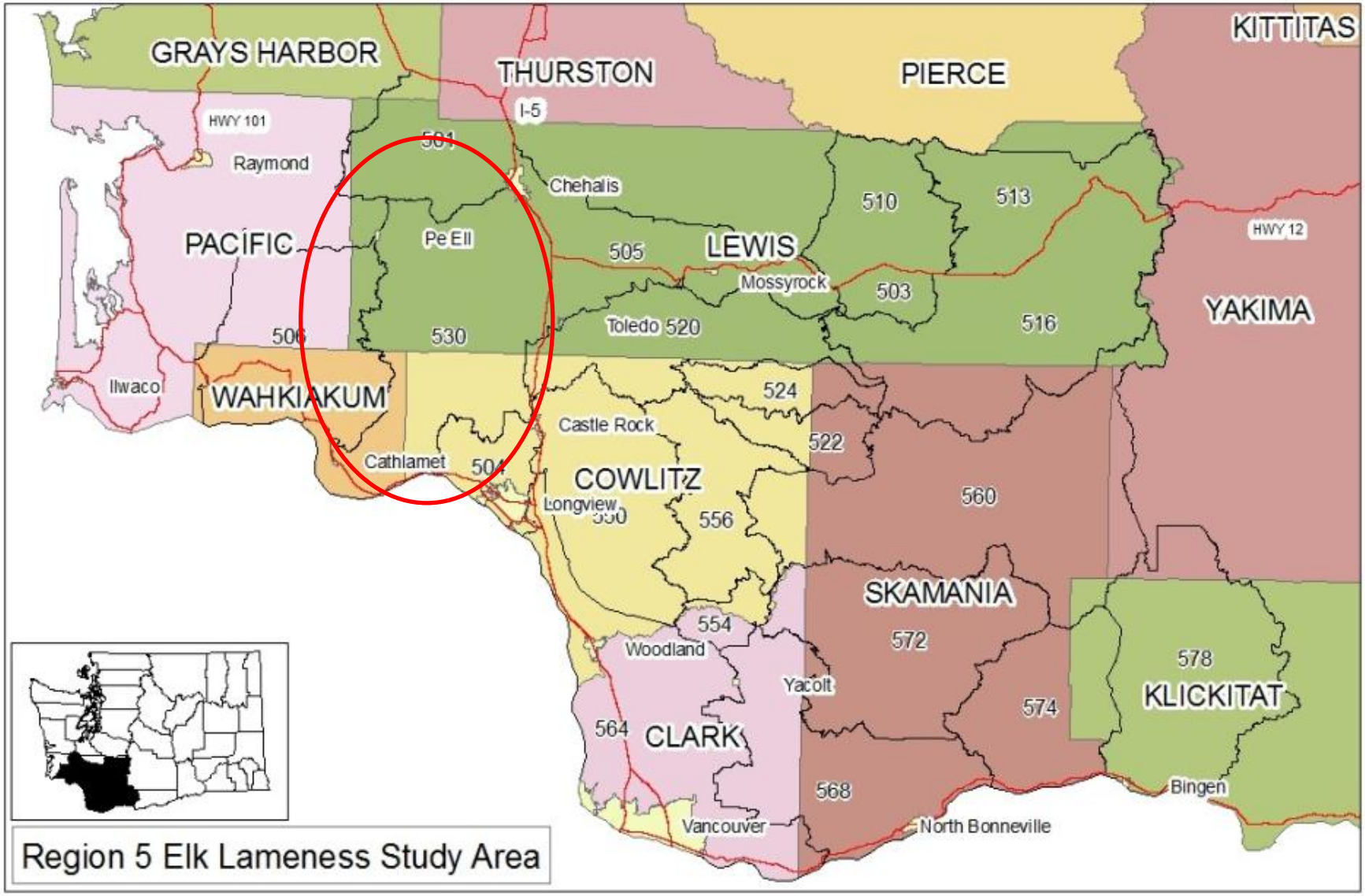
Outline

- Overview of Hoof Disease in SW Washington
- WDFW Elk Hoof Disease Investigation
- General Disease Management Concepts
  - Examples from domestic livestock
- Management Options

Wild Ungulate Hoof Diseases

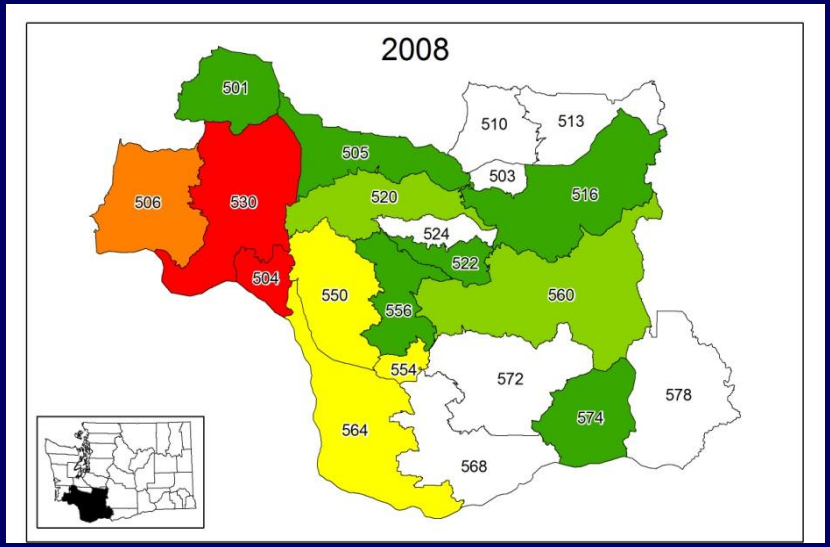
- Usually sporadic and many different causes
- Below are photos from an elk, a moose, and a mule deer, each with a different hoof disease, all collected during Fall 2012 in Eastern WA

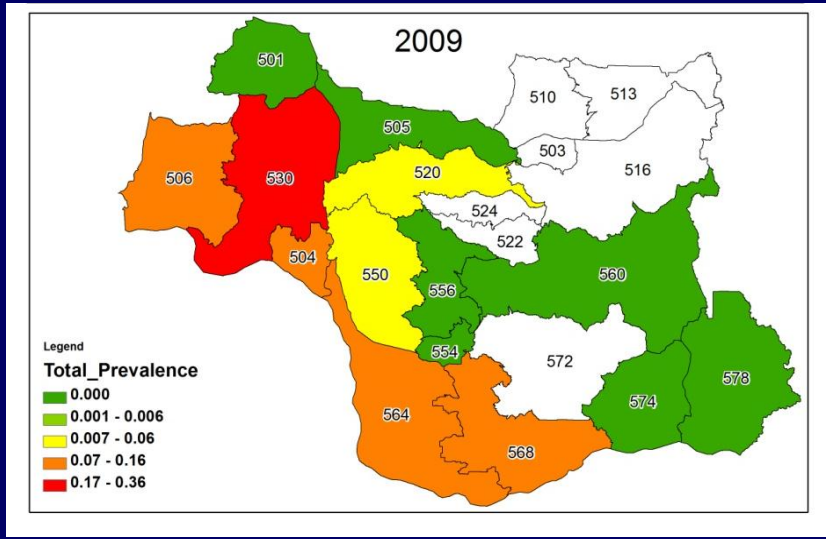
Cowlitz River Basin



Han, S. , K. Mansfield, et al. (2013 in draft)

Prevalence and Distribution 2008-2009





Examples of Deformed Hooves

SW Washington Elk Hoof Disease

- Males and females equally affected
- All ages
- Any hoof
- No reports of increase in domestic livestock hoof diseases in the area

Possible Causes of Hoof Disease?

Infectious

- Bacterial
- Viral
- Endophyte Toxicity

Han, S., 2009

Non-Infectious

- Nutritional imbalance
- Chronic laminitis
- Behavioral changes (diet, mobility, stress)
- Genetic - inherited condition
- Parasitic

Multifactorial

How Hooves Respond to Disease

Regardless of initiating cause, may include:

- Inflammation (laminitis)
- Abnormal growth
- Uneven wear
- Development of sole ulcers
- Secondary bacterial infections
- Sloughing of hoof capsule

Novel Hoof Disease in Elk?

Spillover of Infectious Hoof Disease from Livestock?

- Foot Rot of Domestic Sheep

- Papillomatous Digital Dermatitis (PDD) of Dairy Cattle

Diagnostic Investigation Partners

Assistance of Veterinary Personnel From:

- WDFW
- Washington State University
- University of Washington
- ODFW
- Oregon State University
- University of Wisconsin
- Tufts University

Samples Sent to Veterinary Diagnostic Labs At:

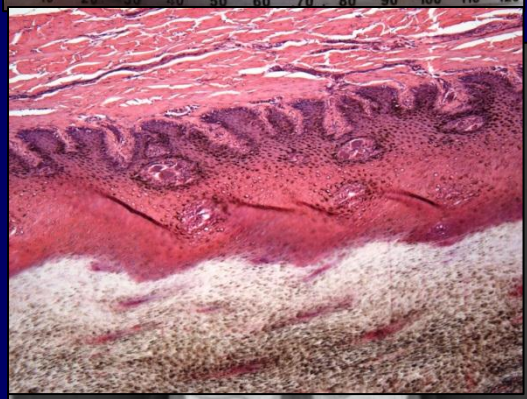
- Washington State University
- University of Idaho
- Colorado State University
- University of Wyoming
- University of Liverpool (U.K.)
- USDA National Veterinary Services Laboratory
- USDA National Animal Disease Center

2009 Diagnostic Investigation

- Gross necropsy
- Radiology
- Histology
- Parasitology
- Virus isolation
- Trace minerals
- Routine bacteriology

2009 Diagnostic Results

- Primary hoof disease with no other tissue involvement
- Chronic, non-specific changes in the hooves
- Non-specific bacterial overgrowth
- Copper and selenium deficient



2009 Diagnostic Conclusions

- Non-specific chronic changes of hooves indicate:
  - need to sample animals earlier in the disease process
- Non-specific bacterial growth indicates:
  - need for specialized microbiology techniques
- Follow-up analysis needed to assess the significance of low Copper and Selenium levels (completed in 2012)

2013 Effort

2013 Effort

- Collection of younger animals
  - Presumably in the earlier stages of the disease, which improves the chances of identifying the original cause
  - Three different study sites
- Specialized Microbiology
  - University of Liverpool
  - USDA National Animal Disease Center

Sampling and Testing of Hooves

Routine bacteriology at Washington State University (WSU)

- ✓ Completed, no significant findings

Specialized bacteriology at University of Liverpool, CSU, possibly University of Sydney

- ➢ Pending, results by end of summer

Radiology at Colorado State University (CSU)

- ✓ Completed, no significant primary lesions

Virology at University of Wyoming

- ✓ Completed, no significant viruses isolated

Histology (microscopic examination) at CSU

- ➢ Pending, initial round completed, but seeking additional opinions

Multiple hoof biopsies collected and stored at WDFW Wildlife Health Laboratory

- ❖ Possible future studies

Additional Sampling and Testing

Histology (microscopic examination) of Organs and Tissues, including Muscle (meat) at WSU

- ✓ Completed, no evidence of significant inflammation or infection above hooves, even in severely affected individuals

Trace Minerals at University of Idaho

- ✓ Completed, low selenium and copper, as expected - possible impacts on general health and immunity

Parasitology at WSU

- ✓ Completed, similar parasite loads in all 3 groups

Serology (infectious agent exposure) at WSU and USDA National Veterinary Services Laboratory

- ✓ *Mostly* completed, no significant antibody exposure
  - *Treponema* sp. serology pending at USDA NAD

Multiple tissues and other samples collected and stored at WDFW Lab

- ❖ Possible future studies

2013 Diagnostic Results Summary

Findings very similar to 2009

- Chronic hoof changes even in 9 month old calves
- Confirmed that disease limited to hooves;
    - Other tissues, including meat, are not affected

Specialized microbiology pending

Specialized Microbiology

Current diagnostic efforts are focused on specialized bacteriology testing to rule out infectious organisms

Including:

- the bacterium *Dichelobacter nodosus* and
- bacteria in the genus *Treponema*,
- the most common causes of infectious hoof disease in sheep and cattle, respectively

Results are expected by end summer

What About Leptospirosis?

Serology on all 16 animals

- 9 from affected area, 7 from unaffected area
- 4/16 had antibodies to *L. icterohemorrhagiae*
  - 1/3 in Region 6
  - 1/4 in Region 3
  - 2/9 in Region 5
- Titers were low (1:100)

Leptospira sp. Serology

Final Report:

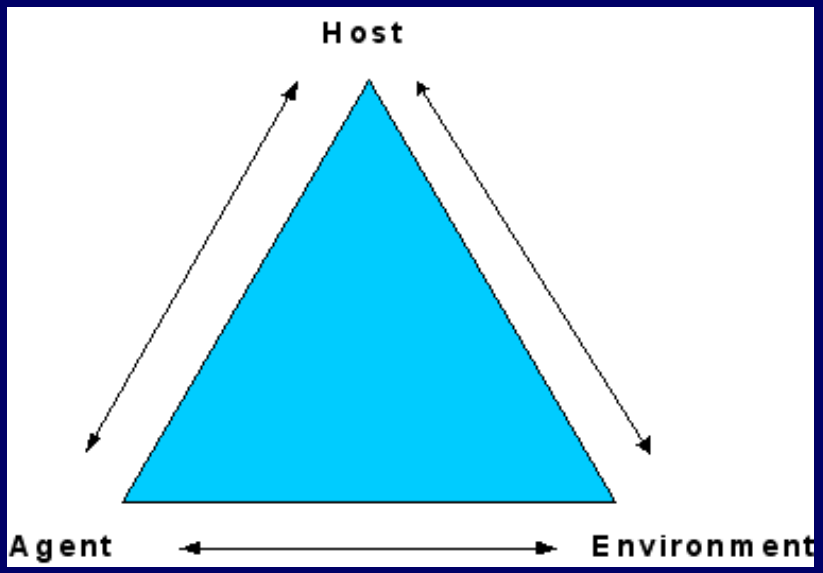
Serology- Reported on 04/18/13 Authorized by James Evermann, Section Head

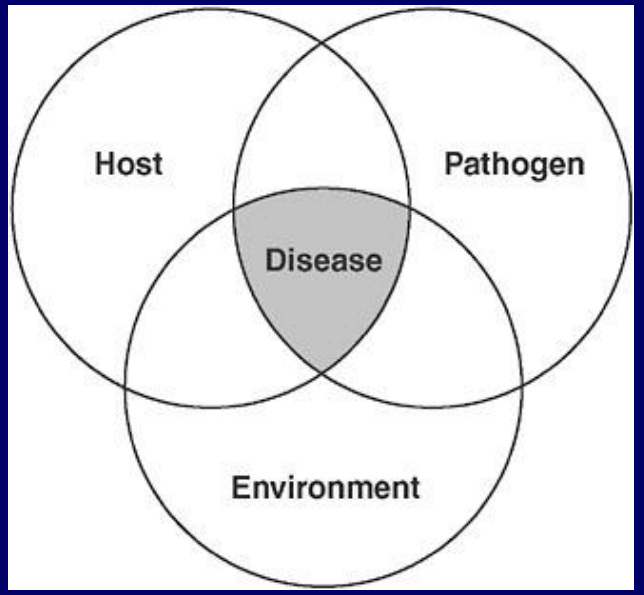
Please see Serology test interpretation comments at end of report

Sample	Animal	L. brat	L. can	L. grip	L. hardj	L. icter	L. pom
1 A Serum	EL-13-004	Neg	Neg	Neg	Neg	POS @1:100	Neg
2 A Serum	EL-13-005	Neg	Neg	Neg	Neg	Neg	Neg
3 A Serum	EL-13-013	Neg	Neg	Neg	Neg	POS @1:100	Neg
4 A Serum	EL-13-014	Neg	Neg	Neg	Neg	Neg	Neg
5 A Serum	EL-13-015	Neg	Neg	Neg	Neg	Neg	Neg
6 A Serum	EL-13-016	Neg	Neg	Neg	Neg	Neg	Neg
7 A Serum	EL-13-008	Neg	Neg	Neg	Neg	Neg	Neg
8 A Serum	EL-13-009	Neg	Neg	Neg	Neg	POS @1:100	Neg
9 A Serum	EL-13-010	Neg	Neg	Neg	Neg	Neg	Neg
10 A Serum	EL-13-011	Neg	Neg	Neg	Neg	Neg	Neg
11 A Serum	EL-13-012	Neg	Neg	Neg	Neg	Neg	Neg
12 A Serum	EL-13-006	Neg	Neg	Neg	Neg	Neg	Neg
13 A Serum	EL-13-007	Neg	Neg	Neg	Neg	Neg	Neg
14 A Serum	EL-13-002	Neg	Neg	Neg	Neg	Neg	Neg
15 A Serum	EL-13-003	Neg	Neg	Neg	Neg	POS @1:100	Neg
16 Peric Fl	EL-13-001	Neg †	Neg	Neg	Neg	Neg	Neg

Disease Management General Overview

Disease Triad





Objectives of Disease Management and Examples

- **Prevention**
  - Movement restrictions on host to prevent spread of pathogen
  - Vaccination to prevent infection with pathogen
- **Control**
  - Treatment (antibiotics, dewormers) of host to eliminate or reduce pathogen
  - Vaccination to reduce shedding of pathogen
  - Reduction of host density to decrease transmission
  - Modification of environment to minimize interaction of host and pathogen
- **Eradication**
  - Eliminate host
  - Destroy or eliminate habitat of host or pathogen
- ***Laissez-faire***
  - "Let Nature take its course"
  - Possible evolution towards more resistant host or less virulent pathogen?

How is Infectious Hoof Disease Managed in Domestic Animals?

- Maintain clean dry environment
- Quarantine new animals before introducing to the rest of the herd
- Trim feet 2X/year; disinfect instruments between animals
- Foot baths 2X/week
- Injectable and/or topical antibiotics

How is Infectious Hoof Disease Managed in Domestic Animals?

- Vaccination
  - Only in sheep and only certain strains of *D. nodosus*
- Good nutrition (including trace minerals)
  - To improve general health, immunity, and hoof structure
- Cull individuals that are severely affected or fail to respond to treatment
  - Hoof disease is the 3rd most common reason for culling dairy cattle

Eradication?

- Can be successful in limited areas (individual farms)

- Large scale mandatory well-organized efforts in Australia and New Zealand have failed to eradicate sheep Foot Rot

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Management Questions

- How often do elk die with hoof disease?
- What is the affect of hoof disease on productivity ?
  - Does hoof disease reduce breeding or likelihood to carry a calf to term ?
- What is the affect of hoof disease on population ?
  - Monitor population growth/decline
  - Important to monitor survival

Examples of Management Options

Reduce elk density

- Reduce transmission and advancement
- Increase nutrient level of remaining animals
- Cull:
  - Targeted removal and/or Increase recreational permits
  - Remove animals in “newer areas”
  - Local not landscape level

<u>Questions/Concerns:</u>

- How effective given bacteria is in soil
- Immunity in some animals/areas
- Access, public willingness

Examples of Management Options

Treatment

- Treat elk - increase elk immunity and nutritious status
  - Test on captive elk
- Treat soil

Questions/Concerns:

- Challenge of achieving treatment on a landscape level
  - Difficult to treat animals
  - Bacteria can develop resistance
- Life cycle of bacteria
  - In different conditions (dry/wet, elevation, etc.)
  - Difference of hoof disease between wet and dry land
- Permanence/prevalence of bacteria in soil
  - Density in soil
  - Different elevations have different prevalence rate
  - Soil composition

Examples of Management Options

Let disease run its course

Questions/Concerns:

- How to determine if effective
  - Infect and test soil in dry versus wet
- Public concern
- Sustainable overall population health

Examples of Management Options

Fencing of affected areas

- Keep elk off/out of core area

Questions/Concerns:

- Feasibility
- Private property
- Maintenance
- Wildlife corridors

Examples of Management Options

Before consideration, need to evaluate if any of these examples of management options are likely to be effective

- Affect on population
- Cost
- Feasibility
- Sustainability

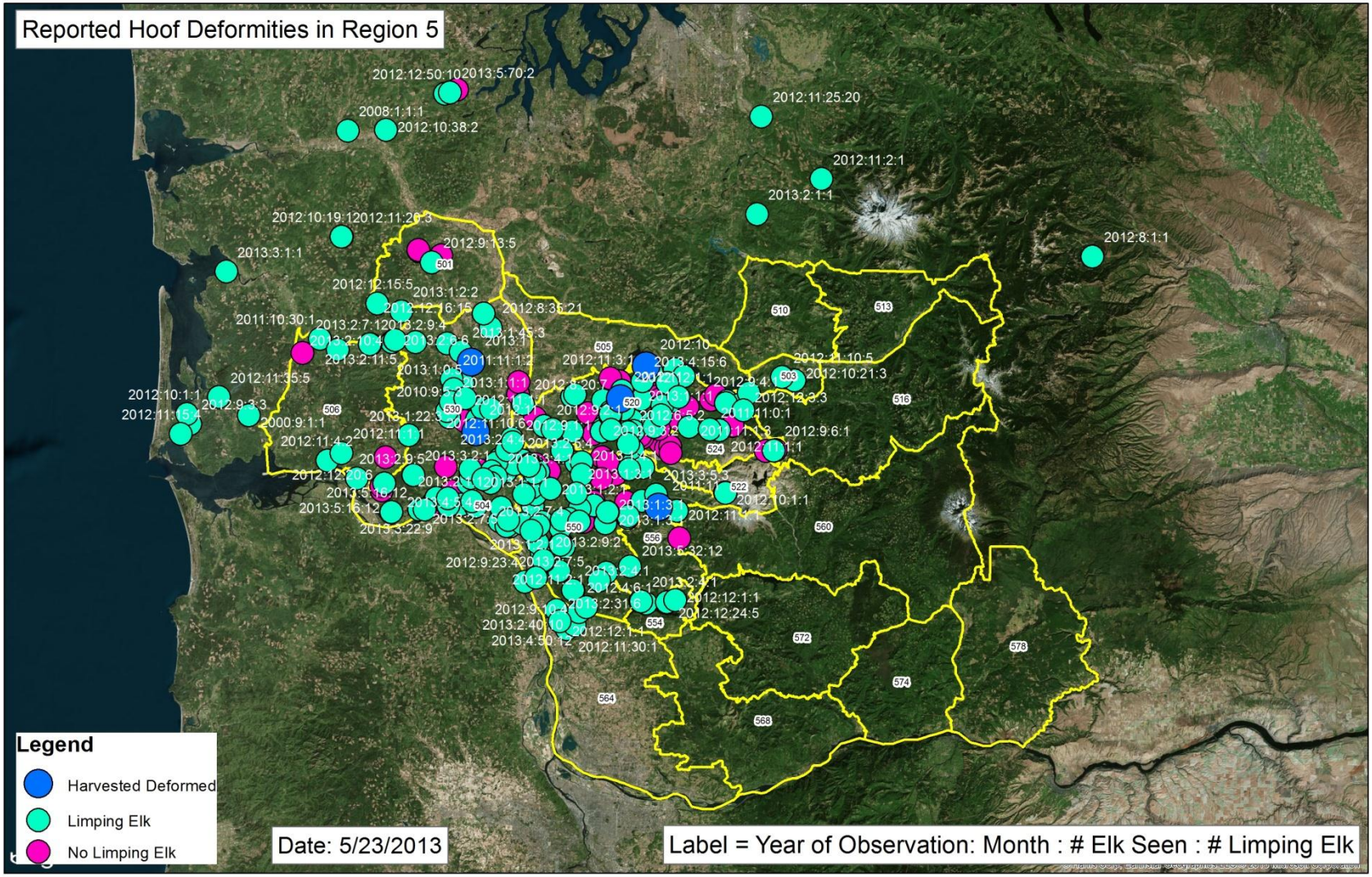
Need to be thorough and thoughtful in how we proceed

Additional Steps Taken

- Developed On-Line Hoof Disease Reporting Form

On-Line Hoof Disease Reporting Form

Help WDFW better understand the distribution and observations of hoof disease by reporting observations



Additional Steps Taken

- Developed On-Line Hoof Disease Reporting Form
- Public Meeting September 12, 2012
- WDFW Elk Hoof Disease webpage
- Hoof Disease Technical Team (WDFW, WSU, DOH)

Outreach

- Public Hoof Disease Working Group
- Hoof Disease Health/Safety Fact Sheet in partnership with Department of Health
- Information in 2013-2014 hunting pamphlet

2013 Washington State Big Game Hunting Pamphlet

Hoof Disease in Elk

CWD & BOVINE TUBERCULOSIS MANAGEMENT

Reports of lameness and deformed hooves in free-ranging Roosevelt elk have been observed in southwest Washington since the mid-1990s. This problem appears to be concentrated in the lowlands in the lower Cowlitz River Valley, but reports have been increasing in number and geographic scope, and hunters are regularly seeing and sometimes harvesting elk with this condition.

One of the challenges in understanding hoof disease in animal populations is that there are over 40 types of hoof diseases of domestic livestock that are known. The type observed in southwest Washington elk does not appear to match with any known hoof diseases in domestic or wild animals and does not seem to be affecting domestic livestock in the area.

Because of the complexity of this situation, additional investigation is needed to help us better understand and manage this problem. WDFW biological and veterinary staff have been working with veterinary experts throughout the country and abroad to develop sampling and testing plans for identifying the cause of hoof disease in southwest Washington elk.

Regarding the public's concerns about the safety of meat from elk with hoof disease, as with all wild animals, WDFW cannot guarantee the safety of game meat. As a general guideline, if the animal appeared and behaved normally before it was harvested; the meat appears and smells normal; good hygiene and common sense practices were used during butchering, storage, and preparation; and the meat is thoroughly cooked; then most likely the meat is safe to eat.

WDFW advises against harvesting any animal that appears sick. And while no specific investigation regarding meat from elk with hoof disease in southwest Washington has occurred, we have not had any reports of the public becoming ill from eating the meat of elk in southwest Washington.

WDFW will keep hunters informed as more information is obtained. Check the Elk Hoof Disease section of the Wildlife Health page at http://wdfw.wa.gov/conservation/health/ .

Hunters can report sightings of elk with exhibiting symptoms of hoof disease to the WDFW website at wdfw.wa.gov/conservation/health/hoof_rot/reporting .

Chronic Wasting Disease

Next Steps

- Specialized microbiology analyses results this summer
- Additional summer sampling, if necessary
- Technical team review feasibility of management options
- Explore management options with public working group
- Implementation

Thank you
….any questions….