



Bluetongue Virus (BTV) and Epizootic Hemorrhagic Disease Virus (EHDV) in North America

Climate Driven Changes

InfoBulletin
September 2022

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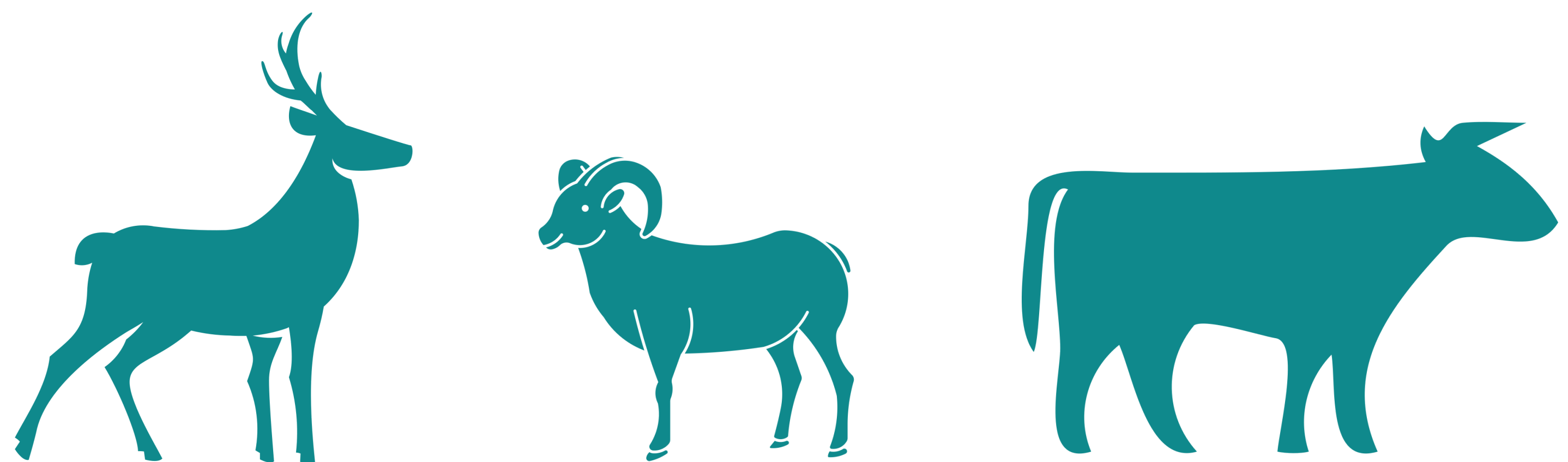
SIGNAL SUMMARY

In late summer of 2021, British Columbia experienced a [mass mortality event in bighorn sheep in Grand Forks](#), near the border with the United States. 20 deceased sheep were found, and the cause of death was determined to be BTV.

Additionally, in September 2021, approximately [30 white-tailed deer were found dead in Ontario](#), and the three that were tested were found to be positive for EHD. In October 2021, four more [white-tailed deer in Ontario](#) tested positive for EHD.

BTV and EHD are closely related hemorrhagic diseases that occur intermittently across North America and primarily infect domestic and wild ungulates. ([Canadian Food Inspection Agency, 2022](#))

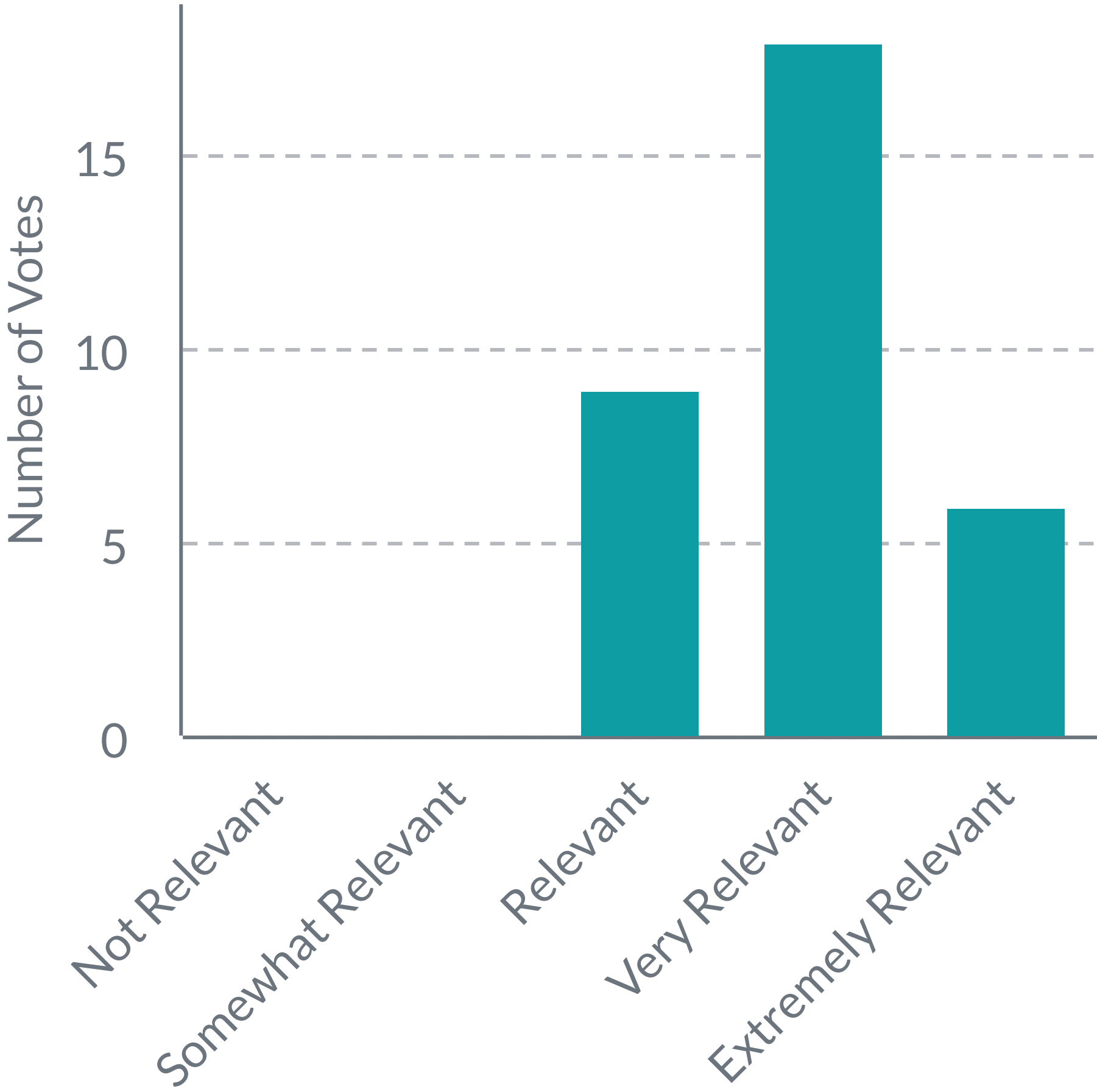
There were also cases of hemorrhagic disease in the US in the Summer and Fall of 2021, with several US states detecting cases of EHD, resulting in hundreds of fatalities in wild white-tailed deer in [Wyoming](#), [Nebraska](#), [New York](#), [Idaho](#), [Michigan](#) and [Washington](#). In November 2021, two cows in [Vermont](#) tested positive for EHD.





TRIAGE

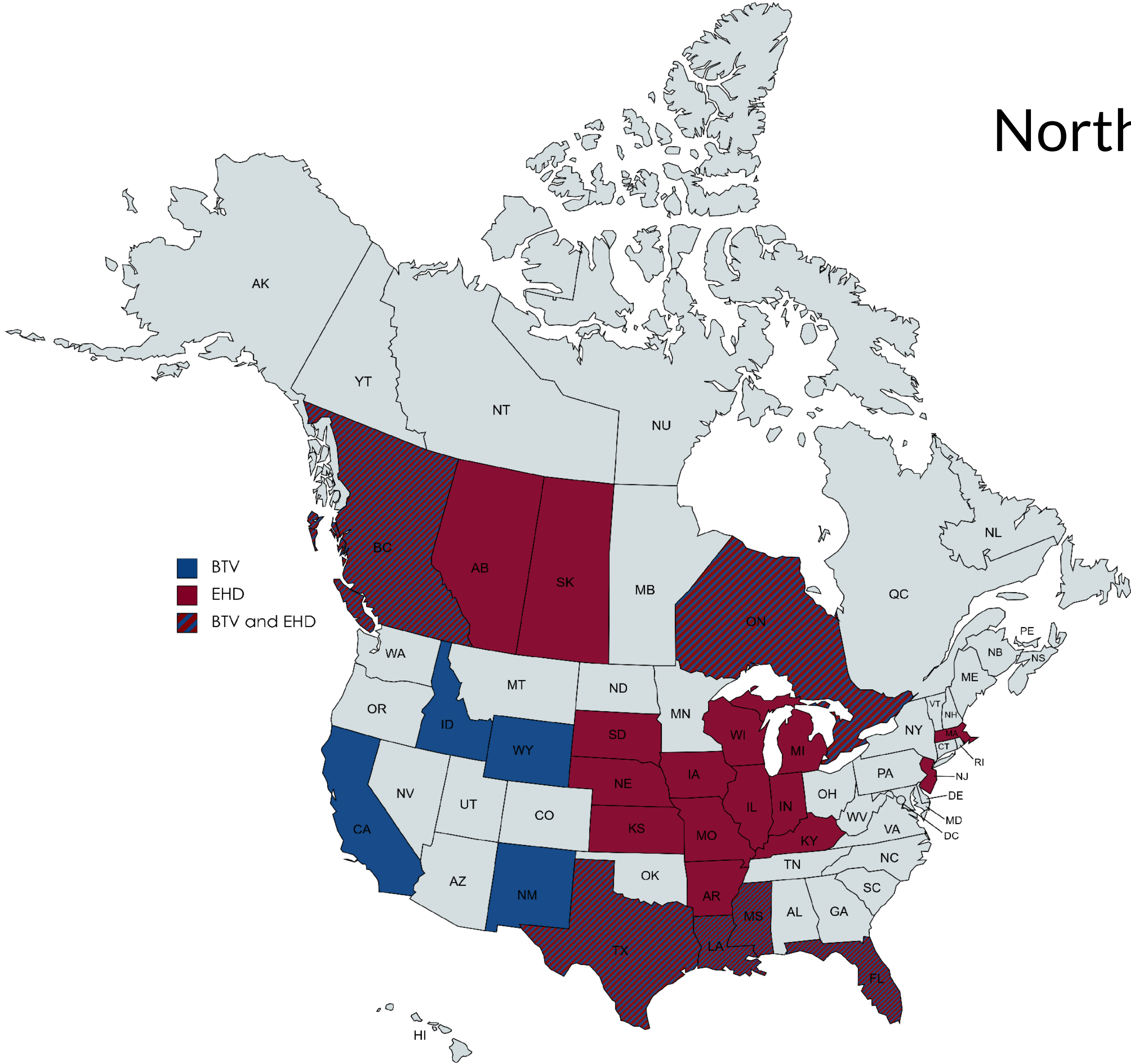
This event was considered in scope for the Community for Emerging and Zoonotic Diseases (CEZD) and was originally sent as a ping poll to the community for feedback on August 26, 2021. The report was considered relevant to extremely relevant by community members.



GLOBAL DISTRIBUTION

BTV and EHD are endemic in the USA, with occasional cases occurring in Canada when seasonal wind patterns blow the midge vectors north ([Government of British Columbia, 2021](#))

BTV typically affects a global band of tropical and subtropical regions (Africa, southern Asia, the Middle East, South America, and Oceania), and EHD has been detected in Africa, Asia, South America, and Oceania ([Center for Food Security and Public Health](#)).



North American Distribution of BTV and EHD

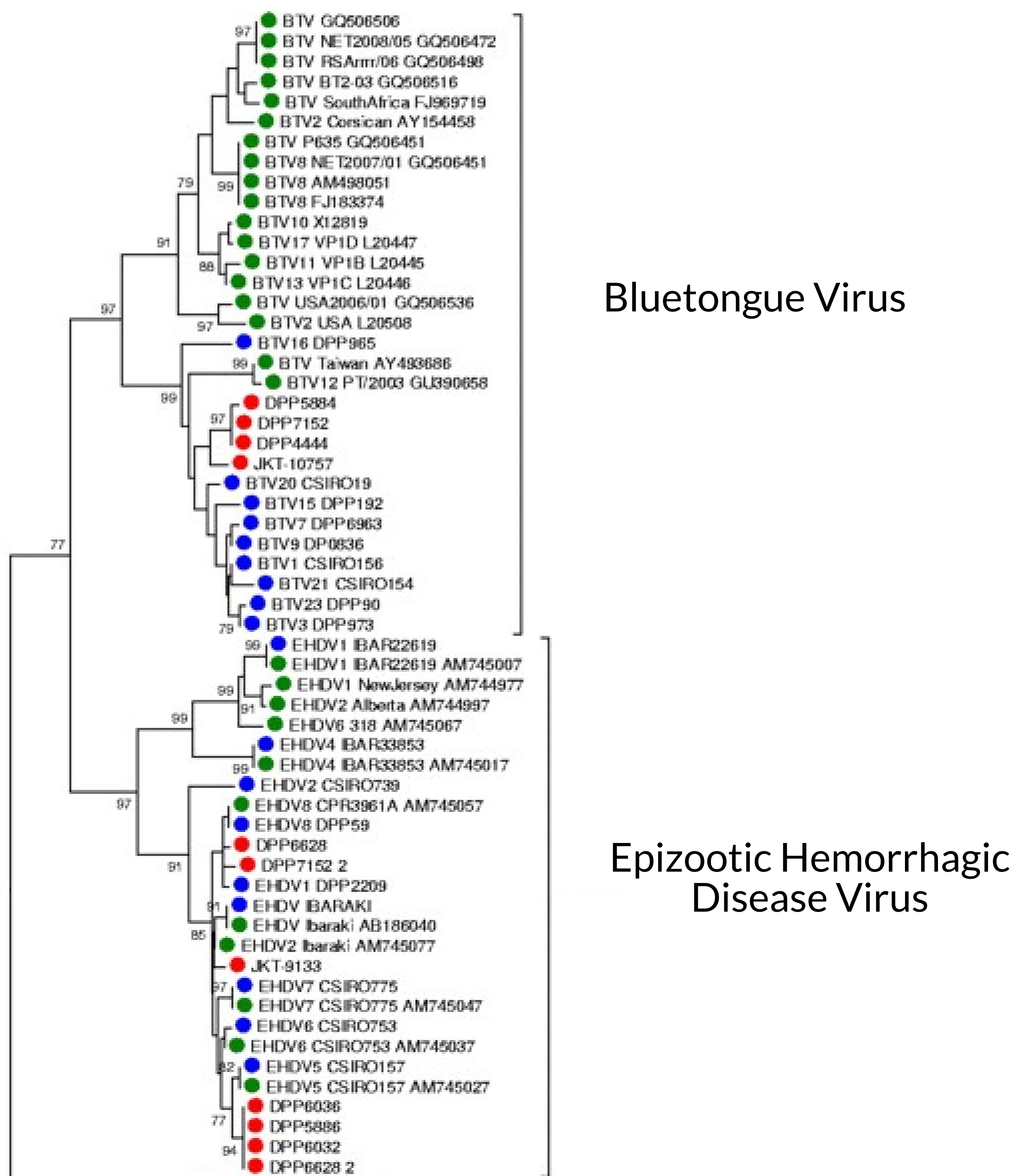
VIRAL TAXONOMY AND TRANSMISSION



BTV and EHD virus (EHDV) are both part of the family Reoviridae and the genus Orbivirus and demonstrate immunological cross-reactivity. BTV has 27 identified serotypes, while EHD has eight (or more) serotypes. ([Centre for Food Security and Public Health Factsheets, WOAH 2019](#))

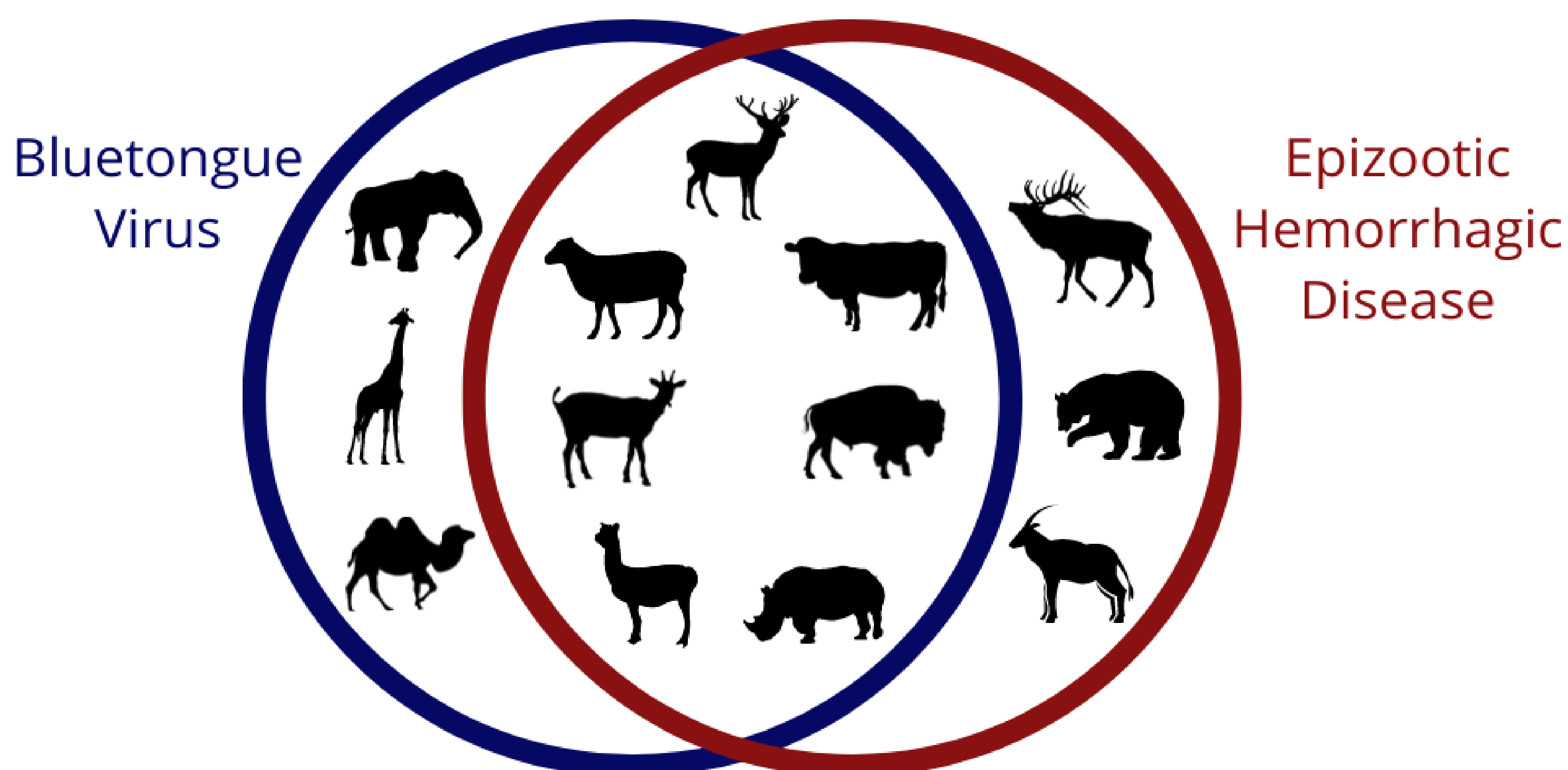


Both BTV and EHD are vector-borne diseases, carried by *Culicoides* spp. midges and affect a variety of **ungulate** species. Cases tend to occur in late Summer and early Fall, and end with the first frost which kills the midge vectors. ([Government of British Columbia, 2021](#))



[Image modified from Palacios et al, 2011](#)

SUSCEPTIBLE SPECIES

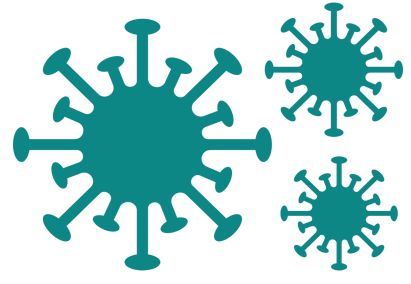


BTB	EHD and BTB	EHD
African buffalo, African elephant, Alpine ibex, Bactrian camel, blackbuck, collared peccary, giraffe, greater kudu, mouflon, musk ox, Siberian ibex, wildebeest.	Alpaca, bighorn sheep, bison, black and white rhinoceros, cattle, domestic sheep, fallow deer, goat, llama, muntjac deer, pronghorn, white-tailed deer, water buffalo, yak	Arabian oryx, black bear, black-tailed deer, brocket deer, goitered gazelles, mule deer, North American elk, red deer, roe deer, rusa deer, wild marsh deer

The primary species affected by BTB is the domestic sheep. Infected sheep experience fever, swelling around the head and neck, and oral lesions. Pregnant ewes can experience abortion or stillbirth. In severe acute cases, pulmonary edema can occur and rapidly result in death ([Centre for Food Security and Public Health - Factsheet Bluetongue](#)).

Additionally, BTB antibodies have been detected in dogs, cats, cheetahs, lions, wild dogs (*Lycaon pictus*), jackals, spotted hyenas and large spotted genets, while clinical signs have been observed in dogs and Eurasian lynx ([Centre for Food Security and Public Health - Factsheet Bluetongue](#)).

The primary species affected by EHD is the white tailed deer. EHD can have up to a 90% fatality rate, with infected deer experiencing fever, dehydration, swelling, especially around the head and neck, and blue mucous membranes due to hemorrhaging. Deceased deer are often found in or near water, as they may seek out water to relieve their fever. ([Indiana Department of Natural Resources, 2022](#). [Centre for Food Security and Public Health - Factsheet Epizootic Hemorrhagic Disease 2019](#))



DETECTION

BTV is typically detected when symptoms occur in domestic animals and is confirmed with laboratory testing ([Rojas et al, 2019](#)).

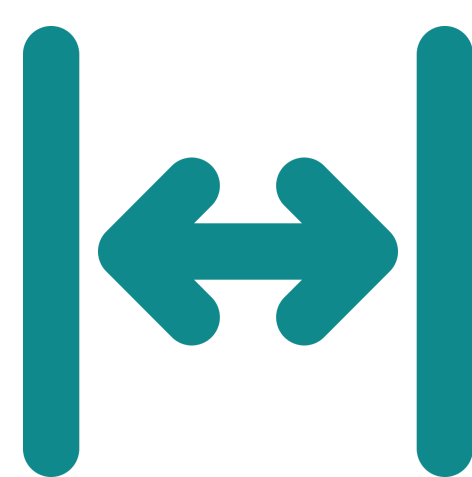
EHD outbreaks are often first alerted by hunters reporting sightings of deceased deer ([Government of Ontario, 2021](#)). Due to the nature of the pathology and the deaths typically occurring in hot weather, deceased deer are often unsuitable for laboratory testing ([Government of British Columbia, 2021](#)), this makes it difficult to quantify the mortality caused by EHD, as cause of death is presumed only.



IMPACT OF WARMING GLOBAL TEMPERATURES

Climate change is impacting the geographical distribution of BTV and EHD. *Culicoides spp.* midges are gradually spreading northward as temperatures increase, meaning that the risk of EHD in Canada is growing ([Zuliani et al, 2015](#)). Additionally, rising temperatures are also resulting in a longer period of activity for *Culicoides spp.* midges, further increasing the potential for BTV and EHD to spread ([Sanders et al, 2019](#)).

Another way in which climate change impacts the spread of EHD is through longer and more severe droughts. EHD is most prevalent in the late summer when deer cluster around scarcer water sources and have more opportunity to be bitten by midges. As water sources become increasingly limited, there will be greater potential for spread of EHD ([Indiana Department of Natural Resources, 2022](#)).



KNOWLEDGE GAPS

Currently, there is no treatment available for BTV or EHD, and the options for prevention and control are limited ([Cornell Wildlife Health Lab, 2018](#)). Additionally, there is a need for further modelling for the expansion of *Culicoides spp.* midges that encompasses all of Canada.

Canadian Food Inspection Agency

- [Fact Sheet - Bluetongue 2015](#)

Cornell Wildlife Health Laboratory

- [Epizootic Hemorrhagic Disease Factsheet, 2021](#)

Government of Alberta

- [Bluetongue Fact Sheet, 2021](#)

Government of British Columbia

- [Epizootic Hemorrhagic Disease in British Columbia - Wildlife Health Fact Sheet 2021](#)

Government of Ontario

- [Epizootic Hemorrhagic Disease in Deer, 2021](#)

The Center for Food Security and Public Health

- [Fact sheet - Bluetongue Virus - 2015](#)
- [Fact sheet - Epizootic Hemorrhagic Disease - 2019](#)

The Northeast Wildlife Disease Cooperative

- [Epizootic Hemorrhagic Disease Fact Sheet](#)

World Organization for Animal Health

- [Epizootic Hemorrhagic Disease Fact Sheet, 2019](#)

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Palacios G, Cowled C, Bussetti A V., Savji N, Weir R, Wick I, et al. Rapid molecular strategy for orbivirus detection and characterization. *J Clin Microbiol.* 2011 Jun;49(6):2314–7. Available from: <https://journals.asm.org/doi/10.1128/JCM.00337-11>

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Rojas JM, Rodríguez-Martín D, Martín V, Sevilla N. Diagnosing bluetongue virus in domestic ruminants: current perspectives. *Vet Med Res Reports.* 2019 Feb;10:17. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6385761/>

Sanders CJ, Shortall CR, England M, Harrington R, Purse B, Burgin L, et al. Long-term shifts in the seasonal abundance of adult *Culicoides* biting midges and their impact on potential arbovirus outbreaks. *J Appl Ecol.* 2019 Jul 1;56(7):1649. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6618056/>

Zuliani A, Massolo A, Lysyk T, Johnson G, Marshall S, Berger K, et al. Modelling the Northward Expansion of *Culicoides sonorensis* (Diptera: Ceratopogonidae) under Future Climate Scenarios. *PLoS One.* 2015 Aug 24;10(8):e0130294. Available from: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0130294>