Minnesota Gray Wolf Disease Screening & Morphology

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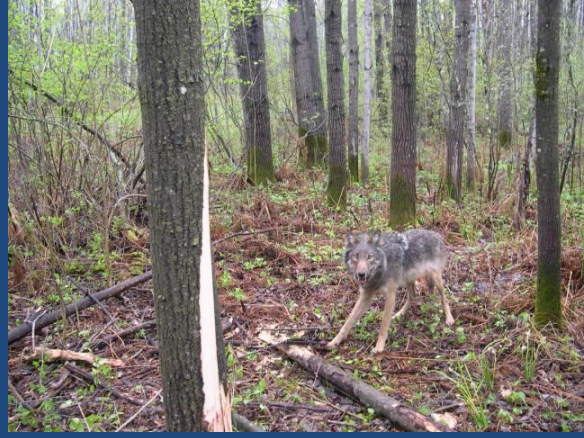
Wildlife

Study Objectives

- Gain an understanding of what diseases & parasites may be impacting the wolf population
  - Previous research has found MN's wolf population is exposed to pathogens that can lead to significant mortality (e.g. canine parvovirus), but limited in scope & scale
  - MN's Wolf Management Plan required health monitoring
- During the delisting battles, the issue of taxonomy and genetic variation was a hot topic
  - Gathering data on morphology and genetics in MN's wolf population will improved our understanding of this issue

Methods



- Collect biological samples from wolves for disease & parasite screening.
  - Whole blood, serum, feces, ticks, brain, heart
- Collect morphological measurements
  - Skull measurements
  - Weight, color, ear length, shoulder height, body & length, and foot length & width
  - Blood & tissue samples for genetic screening
- Goal is to collect samples from 400 wolves throughout wolf range over 2 yrs

Project Collaborators

Minnesota Department of Natural Resources
Wildlife

USDA

WS Wildlife Services
Protecting People | Protecting Agriculture | Protecting Wildlife

USGS
science for a changing world

1854 TREATY AUTHORITY
GRAND PORTAGE · BOIS FORTE

MINNESOTA NATIONAL GUARD
ESTABLISHED 1856
DUTY HONOR SERVICE RESPECT INTEGRITY EXCELLENCE

Source: MNDNR

Source: MNDNR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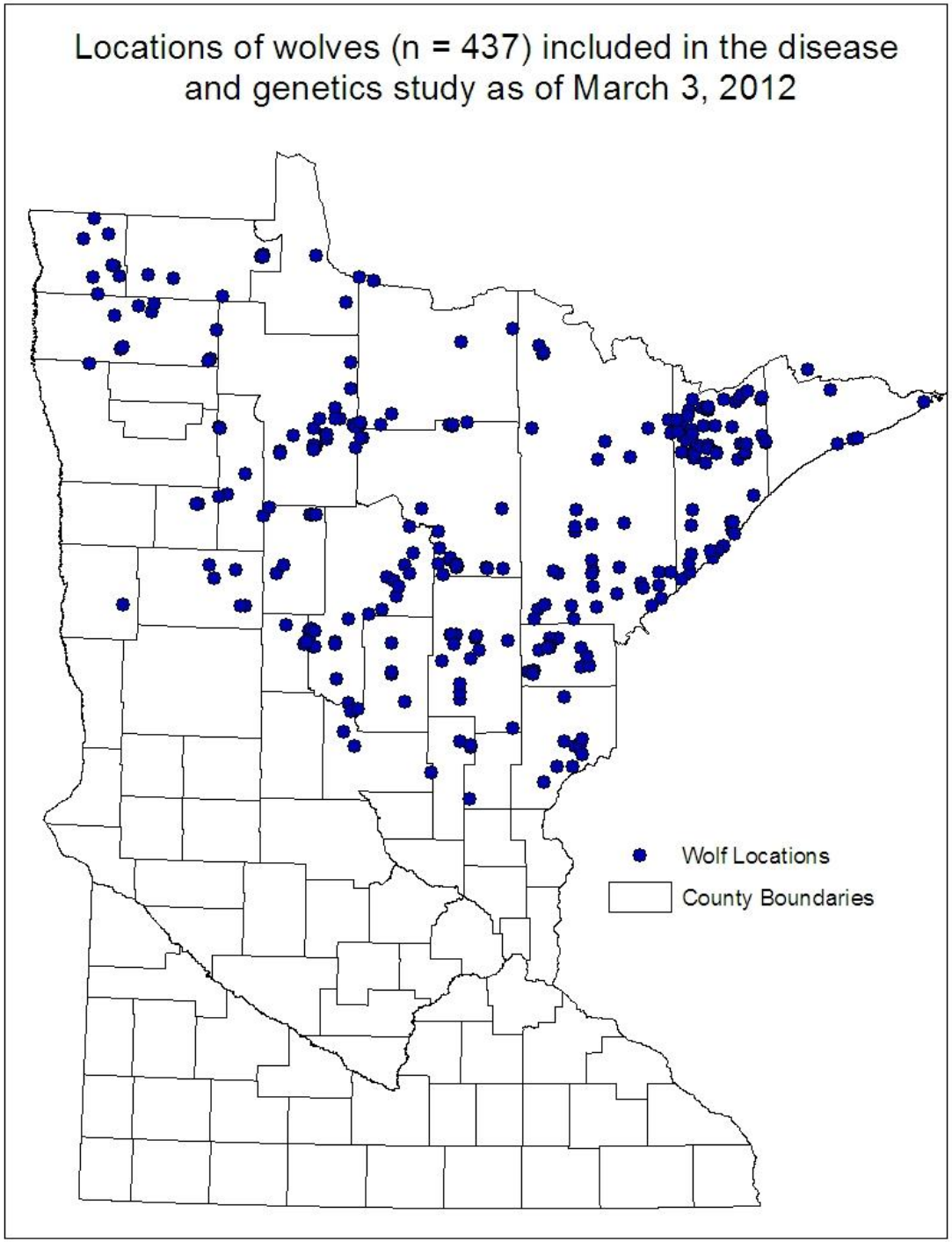


Sampling Sources:

- Euthanized: 252
  - Depredating wolves removed by USDA-WS
- Live caught: 61
  - DNR, 1854 Authority, USGS, Camp Ripley
- Found dead: 75
- Vehicle kill: 36
- Other: 13

Disease Screening Protocol

Canine Parvovirus
Canine Distemper
Canine Adenovirus 1 and 2
Heartworm
Neospora
Borrelia
Eastern Equine Encephalitis
West Nile Virus
Fecal parasitology

Preliminary Results, Diseases and Parasitology

Disease	*n*	No. positives	Apparent prevalence (%)
Canine Parvovirus	190	139	73
Canine Adenovirus 1	192	137	71
Canine Distemper Virus	194	33	17
Eastern Equine Encephalitis	193	6	3
West Nile Virus	194	62	32
Heartworm Disease	195	12	6
Lyme Disease	195	133	68
Neospora*	239	128	54

*some test results are pending; collaboration with Dr. JP Dubey, USDA-ARS

Parasitology: (conducted by Dr. DP Dubey, USDA-ARS)

161 fecal samples were examined by floatation for any evidence of ova or protozoal infection. 20 (12%) had hookworm ova, 9 (6%) had trematode ova, 41 (25%) had sarcocysts, and 2 were positive for neospora (1%).

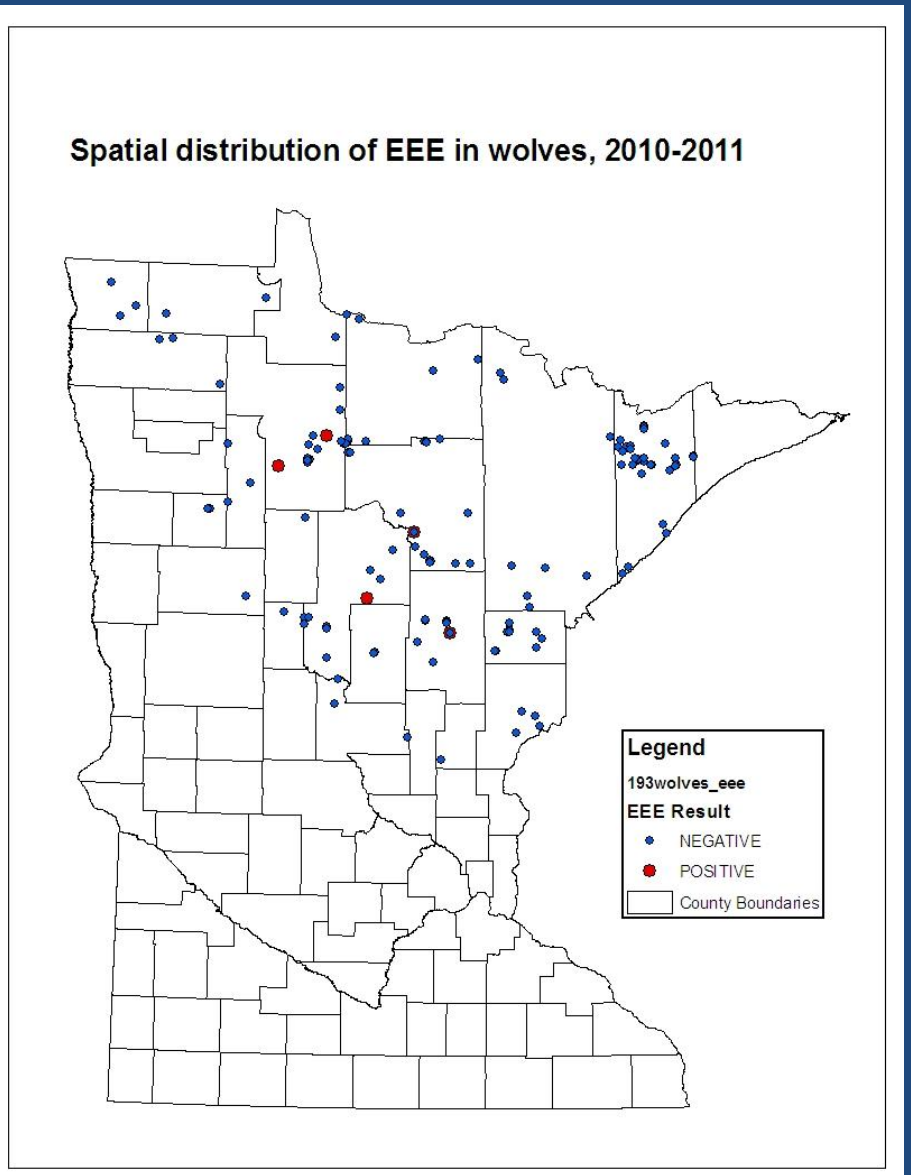
Serological Survey Results

- **Our survey showed that MN wolves are exposed to all 8 disease we screened for; however, these tests confirm EXPOSURE and not current infection!**

- Canine Parvovirus (estimated 73% prevalence)
  - Virus is transmitted through the fecal-oral route and causes diarrhea, fever, and dehydration.
  - Disease can affect most age classes of canids; however mortality is typically highest in pups/juveniles.
- Mech and Goyal (2011) reported 35 years of relationships among wolf pup survival, population change and CPV seroprevalence in northeastern Minnesota to determine when CPV exerted its strongest effects.
  - These authors found the strongest negative effect on pup survival from 1987 to 1993, and little effect afterward, eventhough a mean seroprevalence of 71% was maintained.
  - CPV became endemic and produced its peak effect on the study population, that population developed enough immunity to withstand the disease.

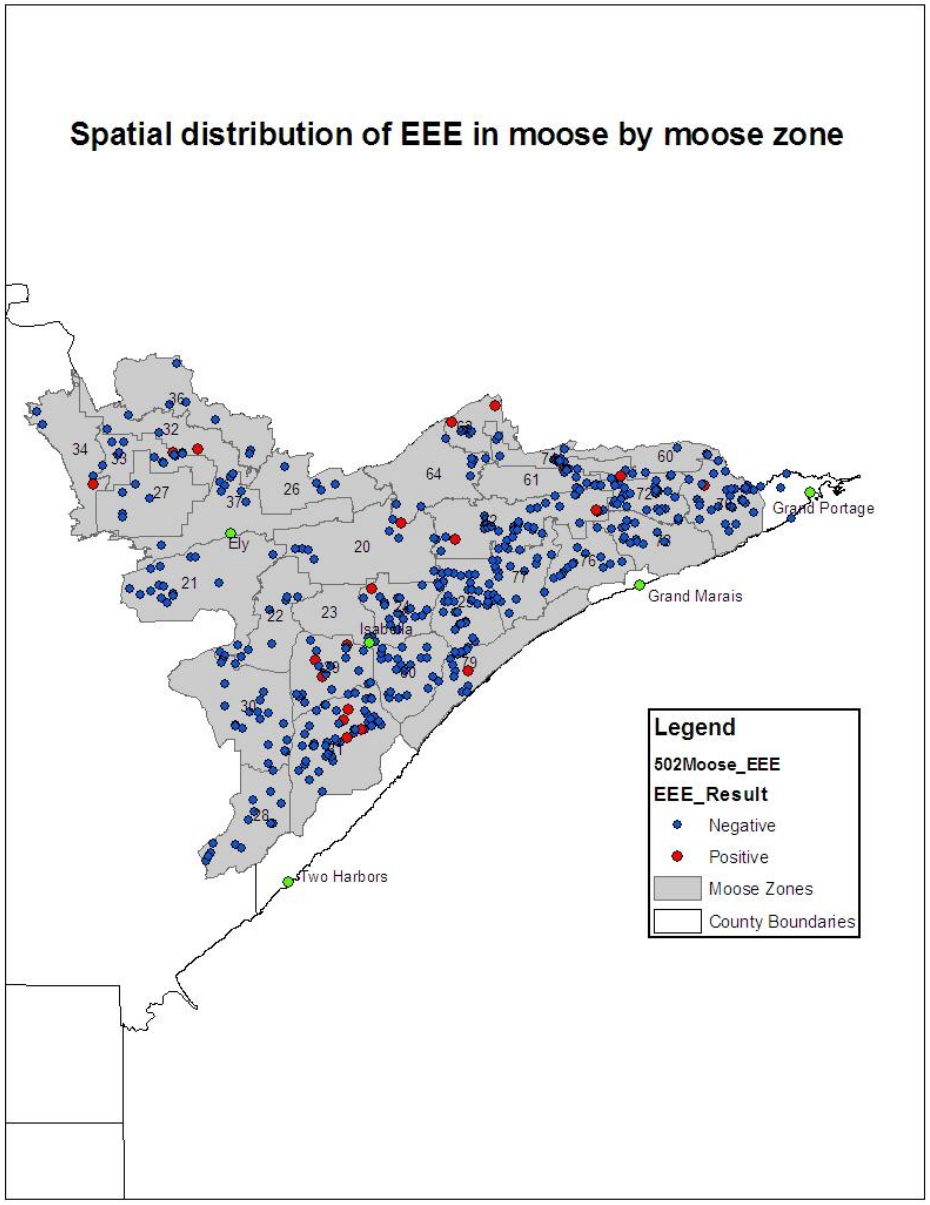
- Canine Adenovirus (estimated prevalence 71%)
  - Our results are less then the 96% reported in Yellowstone's adult wolf population (Almberg et al. 2009).
  - Canine adenovirus 1 causes hepatitis, a disease of the liver and other body organs. The virus is found worldwide and is spread by body fluids including nasal discharge and urine.
  - Canids of any age are susceptible to the disease. Reported mortality in dogs is about 10%, and it remains unclear how endemic CAV 1 infection might impact wolf populations.
- Canine Distemper Virus (estimated prevalence 17%)
  - Wolves in Minnesota showed similar exposure to CDV as Spanish wolves (18.7%), reported by Sobrino et al. (2007).
  - Canine distemper virus is a *Morbillovirus* that infects a broad class of canids. Transmission is through inhalation or ingestion of airborne particles and clinical signs include pneumonia, encephalitis, and death.
  - Outbreaks of CDV in 1999, 2002 and 2005 in free-ranging wolves within Yellowstone National Park correlated with high pup mortality rates (Almberg et al. 2009). CDV appears to be capable of causing dramatic population declines over a short time frame.

Eastern Equine Encephalitis (EEE)

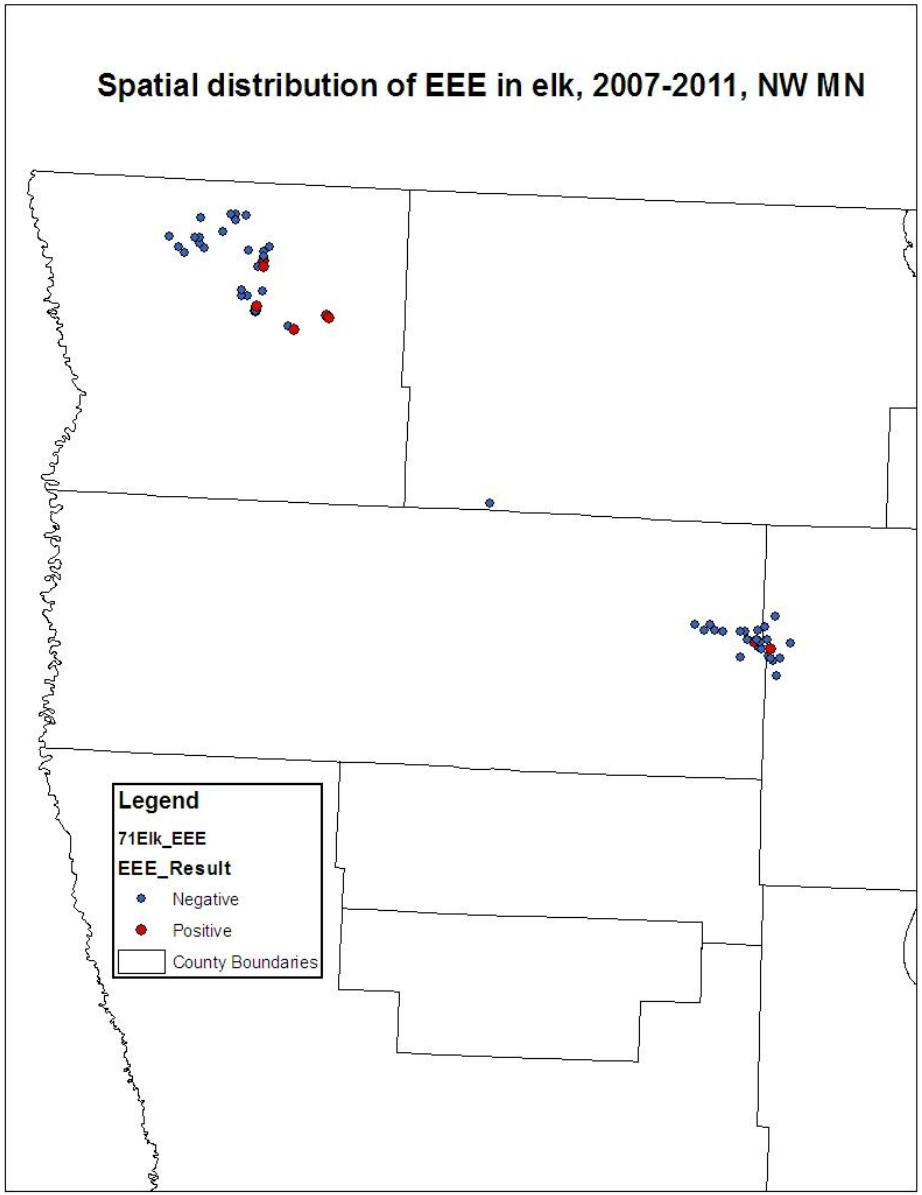


- Virus transmitted by mosquitos; WNV's evil twin!
- Little is known about EEE in wolves; infection has been reported in dogs.
- This disease was not known to exist in MN until we started looking in moose in 2007…….

EEE in moose in NE MN



EEE in elk in NW MN



Neospora

Contents lists available at ScienceDirect

Veterinary Parasitology

journal homepage: www.elsevier.com/locate/vetpar

Rapid communication

Gray wolf (*Canis lupus*) is a natural definitive host for *Neospora caninum*

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- *Neospora caninum* is a protozoal parasite, which is best known for causing abortion in cattle and neurological disease in dogs.
- Infection of canids in turn increases the risk of transmitting the parasite to domestic livestock.
- Domestic dogs, coyotes, and gray wolves are all confirmed definitive hosts for *N. caninum*.
- Our estimated prevalence >54% in wolves (some test results still pending)

Morphology & Genetics

- Approximately 300 skulls have been collected for taxonomic evaluation; 60% have been cleaned by our dermestid beetle colony thus far.
  - Morphological measurement of cleaned skulls from wolves will follow procedures as described in Nowak 1995.
  - Each skull will be permanently catalogued in the mammal collection at the Bell Museum.
- 150 genetic samples were submitted to the U.S. Fish and Wildlife Forensics Laboratory (Ashland, WI) for analysis as in Fain et al (2010).
  - Focus will be on elucidating any spatial differences or patterns in molecular or morphological attributes, and assessing whether any observed molecular patterns translate into meaningful morphological differences.
- New information has been presented in vonHoldt et al. (2011) that indicates wolves in Minnesota are predominantly gray wolves with admixture from coyotes that dates between 600-900 years ago. This may require additional analysis that could help identify the genetic makeup of wolves in Minnesota.
- Although these articles indicate competing information about the genetic identity of wolves in Minnesota, additional analysis will help inform the understanding of this phenomenon.

Management Implications

- Will document disease & parasite exposure & prevalence (inter- and intra-pack) in MN's wolves
  - Diseases can limit population growth & expansion
  - Disease can cause major issues at the livestock/wildlife interface
  - Disease presence can influence long-term management goals for wolves (e.g. season setting, quotas, etc)
- Results may lead to a more specific research project
- Morphological/genetic data may further enhance our understanding of grey wolf speciation (of lack there of) should relisting challenges emerge.

Questions?