

## **SURVEILLANCE FOR HIGHLY PATHOGENIC AVIAN INFLUENZA IN MINNESOTA'S WATERFOWL**

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### **SUMMARY OF FINDINGS**

As part of a national strategy for early detection of highly pathogenic avian influenza (HPAI) in North America, Minnesota Department of Natural Resources (MNDNR) and the United States Department of Agriculture (USDA) conducted surveillance for the virus in waterfowl in the state. A combined total of 1,558 birds were sampled for HPAI in Minnesota during 2007. Testing did not result in any positive cases of HPAI, especially the Asian strain of subtype H5N1, however numerous duck species ( $n=7$ ) did test positive for a low pathogenic strain of avian influenza with the subtype H5 or N1. Approximately 95,843 wild birds were sampled throughout the United States in 2007, and no positive cases of HPAI were detected. It is likely that Minnesota will continue surveillance for the virus in the state's waterfowl next year, in cooperation with the Mississippi Flyway, Council of the U.S. Fish and Wildlife Service, and the USDA.

### **INTRODUCTION**

Recent worldwide attention on the spread of a highly pathogenic strain of avian influenza, subtype H5N1, from Asia to Europe and Africa in 2006 has led to the development of a coordinated National Strategic Plan for early detection of HPAI-H5N1 introduction into North America by wild birds. Although movements of domestic poultry or contaminated poultry products, both legally and illegally, are believed to be the major driving force in the spread of HPAI-H5N1, migratory birds are thought to be a contributing factor.

This national plan outlined a surveillance strategy that targeted sampling of wild birds species in North America that have the highest risk of being exposed to or infected with HPAI-H5N1 because of their migratory movement patterns. Currently, these include birds that migrate directly between Asia and North America, birds that may be in contact with species from areas in Asia with reported outbreaks, or birds that are known to be reservoirs of AI. A step-down plan was developed by the Mississippi Flyway Council in 2006 identifying Minnesota as a key flyway state needed to participate in regional sampling for early detection of HPAI-H5N1 in migratory ducks, geese, and shorebirds.

In June 2007, the MNDNR entered into a \$100,000 cooperative agreement with the United States Department of Agriculture's Wildlife Services (USDA-WS) to sample 750 wild birds (either live-caught or hunter-harvested) in Minnesota for HPAI-H5N1 during 2007. In addition to the 750 samples to be collected by MNDNR, USDA-WS was also planning to collect a similar number of samples in the state during the same period. Bird species that were targeted include those listed as priority species in the National Strategic Plan or approved for sampling in Minnesota by the Mississippi Flyway Council.

Avian influenza is a viral infection that occurs naturally in wild birds, especially waterfowl, gulls, and shorebirds. It is caused by type A influenza viruses that have 2 important surface antigens, hemagglutinin (H) and neuraminidase (N), that give rise to 144 possible virus subtypes. Influenza viruses vary widely in pathogenicity and ability to spread among birds. The emergence of an Asian strain HP-H5N1 virus in 1996 and subsequent spread of the virus in Asia, Africa, and Europe has killed thousands of wild birds and millions of domestic poultry. In 1997, HP-H5N1 became zoonotic in Hong Kong and to-date has infected at least 380 humans in Eurasia and Africa, resulting in over 240 deaths.

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## METHODS

The MNDNR planned to sample 125 common goldeneye (*Bucephala clangula*) and 125 ring-necked ducks (*Aythya collaris*) during the summer months, primarily in conjunction with planned banding activities. In the fall, through hunter surveillance, the above 2 species were targeted along with the following: 100 Northern pintails (*Anas acuta*), 100 mallards (*Anas platyrhynchos*), 100 American green-winged teal (*Anas crecca*), 100 American blue-winged teal (*Anas discors*), 50 Northern shovelers (*Anas clypeata*), and 50 American wigeon (*Anas americana*). USDA-WS planned to sample a similar number of either the duck species mentioned above or other from their functional group (e.g., dabblers, divers, shorebirds) as well as 50 Canada geese (*Branta Canadensis*). If sampling goals per species could not be met, other targeted waterfowl species within the same functional group can be sampled and counted toward the state's total. Sampling strategies were coordinated between the MNDNR and USDA-WS to maximize access to targeted birds species through existing banding operations and fall hunter-harvested surveillance.

Cloacal and oral-pharyngeal swabs were used to collect samples and they were submitted to the Veterinary Diagnostic Laboratory in St. Paul, MN for initial screening for the virus. If positive for avian influenza virus, samples were forwarded to the National Veterinary Services Laboratories in Ames, IA for strain-typing.

## RESULTS AND DISCUSSION

From April 1, 2007 through March 31, 2008 MNDNR and USDA collected a total of 1,558 samples from wild-caught live birds ( $n=585$ ), hunter-harvested birds ( $n=896$ ), and mortality/morbidity events ( $n=77$ ). USDA also collected 706 fecal samples. Thus, a combined total of 2,264 birds were sampled for HPAI-H5N1 in Minnesota in 2007 (Figure 1, Table 1).

Testing did not result in any positive cases of HPAI-H5N1; however 7 different duck species tested positive for a low pathogenic strain of avian influenza with the subtype H5, and 3 tested positive for an N1 subtype (Figure 2, Table 2). The testing protocol was limited to the screening for H5, H7, and N1 subtypes only.

According to the latest numbers on the United States Geologic Survey's website (<http://wildlifedisease.nbio.gov/ai/>), approximately 95,843 birds have been sampled for HPAI-H5N1 in the U.S. in 2007. No positive cases of HPAI-H5N1 have been found anywhere in North American to date. However, NVSL did report 293 positive low pathogenic H5 cases nationwide.

Surveillance for HPAI-H5N1 will likely continue in Minnesota, and other parts of the U.S. next year. The USDA has banked all samples taken in 2006 and 2007, and is currently accepting proposals from state agencies and universities for further avian influenza research. Minnesota remains prepared to assist with future surveillance objectives if needed. In addition, the MNDNR has developed a surveillance and response plan for HPAI in wild birds, which includes increased vigilance of mortality and morbidity events within the state.

## ACKNOWLEDGEMENTS

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Table 1. Bird species sampled for highly pathogenic avian influenza H5N1 by Minnesota Department of Natural Resources and United States Department of Agriculture-Wildlife Services in 2007. Table includes live-bird, hunter-harvested, mortality/morbidity, and fecal sampling<sup>1</sup>.

Species sampled	<i>n</i>
Ducks	
American Coot	4
American Green-Winged Teal	253
American Wigeon	85
American Blue-Winged Teal	282
Canvasback	12
Common Goldeneye	71
Common Merganser	17
Gadwall	24
Greater Scaup	5
Hooded Merganser	19
Lesser Scaup	125
Mallard	399
Northern Pintail	272
Northern Shoveler	90
Red-breasted Merganser	1
Redhead	16
Ring-Necked Duck	255
Wood Duck	139
Canada Geese	60
Other	
American White Pelican	20
Caspian Tern	4
Common Loon	1
Double-Crested Cormorant	8
Herring Gull	8
Ring-Billed Gull	8
Total	2,178

<sup>1</sup>Fecal samples (*n* = 86) not attributable to an individual species were excluded.

Table 2. Results of avian influenza testing by the National Veterinary Services Laboratories (NVSL) from samples submitted by Minnesota in 2007.

Species	Date collected	Test type <sup>1</sup>	Test result	County	Lat/long
American Green-Winged Teal	09/04/2007	AI NVSL – Subtyping	H10N3	Roseau	48.95324 / -96.01311
American Green-Winged Teal	09/04/2007	AI NVSL – Subtyping	H3N1	Roseau	48.95383 / -96.06305
American Green-Winged Teal	09/30/2007	AI NVSL – Subtyping	H4N8	Nicollet	44.27786 / -94.235
American Green-Winged Teal	09/29/2007	AI NVSL - Subtyping	H6N8	Anoka	45.32768 / -93.07622
American Green-Winged Teal	09/04/2007	AI NVSL - AIV N1 RRT-PCR	POS	Roseau	48.95383 / -96.06305
American Green-Winged Teal	09/30/2007	AI Screen - AIV H5 RRT-PCR	POS	Nicollet	44.27786 / -94.235
American Green-Winged Teal	09/04/2007	AI Screen - AIV H5 RRT-PCR	POS	Roseau	48.95383 / -96.06305
American Green-Winged Teal	09/04/2007	AI Screen - AIV H5 RRT-PCR	POS	Roseau	48.95383 / -96.06305
American Green-Winged Teal	09/04/2007	AI Screen - AIV H5 RRT-PCR	POS	Roseau	48.95383 / -96.06305
American Green-Winged Teal	09/04/2007	AI Screen - AIV H5 RRT-PCR	POS	Roseau	48.95383 / -96.06305
American Green-Winged Teal	09/04/2007	AI Screen - AIV H5 RRT-PCR	POS	Roseau	48.95324 / -96.01311
American Green-Winged Teal	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Anoka	45.32768 / -93.07622
American Green-Winged Teal	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Nicollet	44.27786 / -94.235
American Wigeon	10/01/2007	AI NVSL - AIV H5 RRT-PCR	POS	Marshall	48.47798 / -95.92484
American Wigeon	10/05/2007	AI NVSL - AIV H5 RRT-PCR	POS	Marshall	48.50534 / -95.86086
American Wigeon	10/01/2007	AI Screen - AIV H5 RRT-PCR	POS	Marshall	48.47798 / -95.92484
American Wigeon	10/05/2007	AI Screen - AIV H5 RRT-PCR	POS	Marshall	48.50534 / -95.86086
American Wigeon	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Itasca	47.3167 / -93.79055
Blue-Winged Teal	09/29/2007	AI NVSL - Subtyping	H4N6	Murray	43.97879 / -95.5338
Blue-Winged Teal	09/29/2007	AI NVSL - AIV H5 RRT-PCR	POS	Big Stone	45.22232 / -96.19533
Blue-Winged Teal	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Chisago	45.39415 / -92.95867
Blue-Winged Teal	09/30/2007	AI Screen - AIV H5 RRT-PCR	POS	Murray	43.97879 / -95.5338
Blue-Winged Teal	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Wabasha	44.21768 / -91.9279
Blue-Winged Teal	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Big Stone	45.22232 / -96.19533
Blue-Winged Teal	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Murray	43.97879 / -95.5338
Lesser Scaup	10/28/2007	AI NVSL - AIV H5 RRT-PCR	POS	Marshall	48.50534 / -95.86086
Lesser Scaup	10/27/2007	AI Screen - AIV H5 RRT-PCR	POS	Marshall	48.50534 / -95.86086
Lesser Scaup	10/28/2007	AI Screen - AIV H5 RRT-PCR	POS	Marshall	48.50534 / -95.86086
Mallard	09/29/2007	AI NVSL - Subtyping	H3N8	Cass	46.99385 / -93.91222
Mallard	09/29/2007	AI NVSL - Subtyping	H6N1	Anoka	45.26978 / -93.12812
Mallard	09/29/2007	AI NVSL - Subtyping	N4	Anoka	45.26978 / -93.12812
Mallard	09/29/2007	AI NVSL - AIV H5 RRT-PCR	POS	Anoka	45.26978 / -93.12812
Mallard	09/29/2007	AI NVSL - AIV N1 RRT-PCR	POS	Anoka	45.26978 / -93.12812
Mallard	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Clearwater	47.408989 / -95.2981
Mallard	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Nicollet	44.27786 / -94.235
Mallard	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Anoka	45.26978 / -93.12812
Mallard	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Anoka	45.26978 / -93.12812
Mallard	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Murray	43.97879 / -95.5338
Mallard	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Cass	46.99385 / -93.91222
Mallard	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Cass	46.99385 / -93.91222
Northern Pintail	09/29/2007	AI NVSL - Subtyping	H11N9	Marshall	48.47798 / -95.92484
Northern Pintail	09/11/2007	AI NVSL - Subtyping	H3N6	Roseau	48.9583 / -96.06305
Northern Pintail	09/29/2007	AI NVSL - Subtyping	N1	Anoka	45.32768 / -93.07622
Northern Pintail	10/19/2007	AI NVSL - Subtyping	N1	Marshall	48.50534 / -95.86086

Table 2 continued.

Northern Pintail	09/29/2007	AI NVSL - Subtyping	N4	Anoka	45.32768 / -93.07622
Northern Pintail	09/29/2007	AI NVSL - AIV N1 RRT-PCR	POS	Anoka	45.32768 / -93.07622
Northern Pintail	09/11/2007	AI Screen - AIV H5 RRT-PCR	POS	Roseau	48.9583 / -96.06305
Northern Pintail	09/14/2007	AI Screen - AIV H5 RRT-PCR	POS	Roseau	48.95383 / -96.06305
Northern Pintail	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Anoka	45.32768 / -93.07622
Northern Pintail	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	St Louis	46.90168 / -92.23829
Northern Pintail	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Clearwater	47.408989 / -95.2981
Northern Pintail	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Marshall	48.47798 / -95.92484
Northern Pintail	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Marshall	48.47798 / -95.92484
Northern Pintail	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Marshall	48.47798 / -95.92484
Northern Pintail	10/19/2007	AI Screen - AIV H5 RRT-PCR	POS	Marshall	48.50534 / -95.86086
Northern Shoveler	09/29/2007	AI NVSL - Subtyping	H3N9	Itasca	47.3167 / -93.79055
Northern Shoveler	09/29/2007	AI Screen - AIV H5 RRT-PCR	POS	Itasca	47.3167 / -93.79055

<sup>1</sup>Test results include AI NVSL Subtyping = identifies other strains of avian influenza that are not H5; AI NVSL-AIV N1 RRT-PCR = tests for N1 avian influenza subtype; AI NVSL-AIV H5 RRT-PCR = test for the H5 avian influenza subtype.

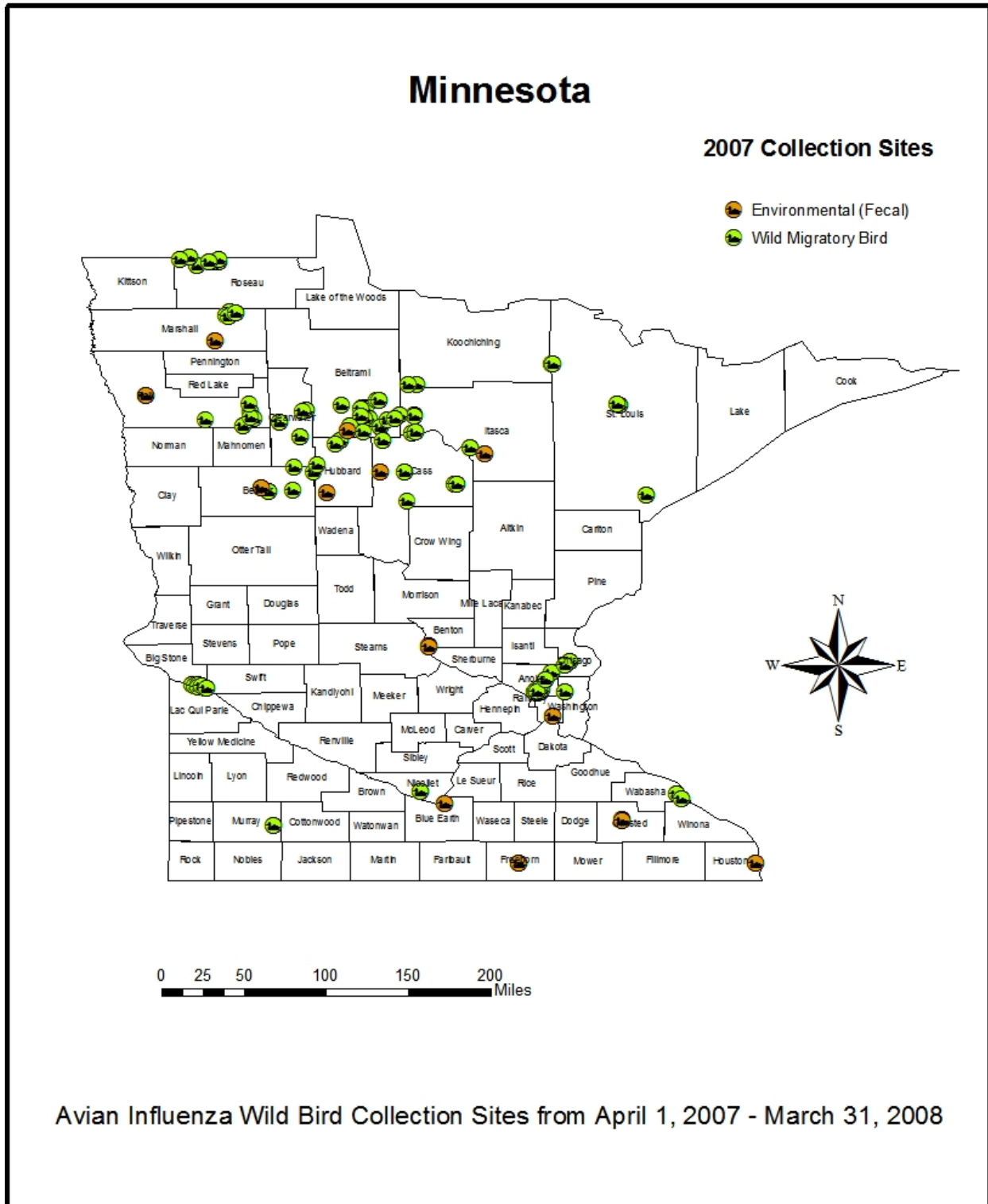


Figure 1. Collection sites from which live bird and environmental (fecal) samples were tested for highly pathogenic avian influenza in Minnesota during 2007.

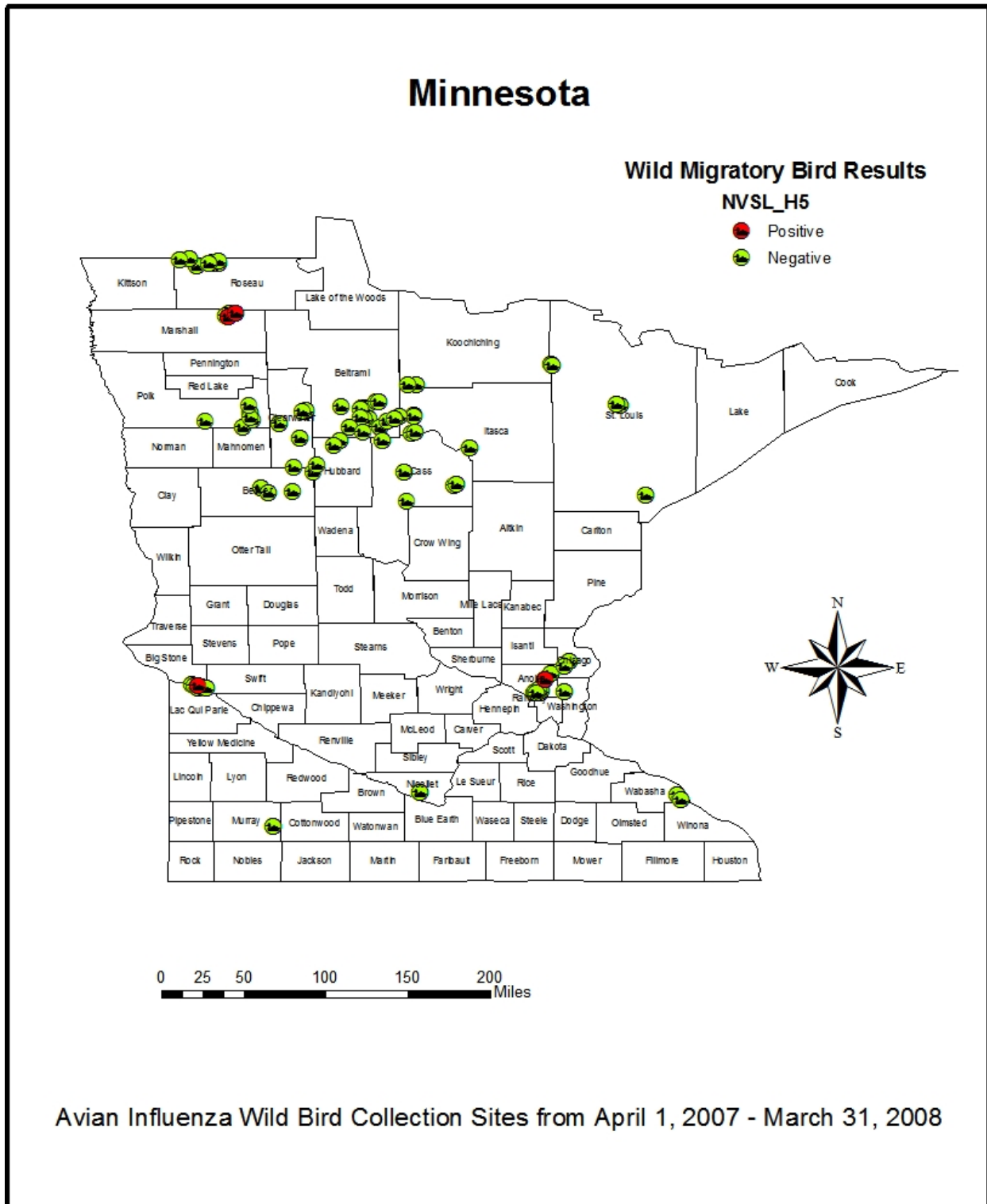


Figure 2. Collection sites where a low pathogenic H5 strain was detected (red dots) among the waterfowl sampled in Minnesota during 2007.