

Washington State Department of Health
Zoonotic Disease Program

Plague

Wildife Plague Surveillance in Washington State
Summary Report, 2010-2014

July 2016

Wildlife Plague Surveillance Partners

We wish to acknowledge and thank our surveillance partners for their contributions:

Partners

Shannon Murphie, Makah Tribe Forestry, Wildlife Division

Sandra Celestine, Yakama Nation, Wildlife Resource

Sean Carrell, Washington State Department of Fish and Wildlife

Colin Leingang, JBLM Yakima Training Center, Wildlife Program

John Young, U.S. Centers for Disease Control and Prevention, Vector-Borne Infectious Diseases

Sarah Bevins, U.S. Department of Agriculture, APHIS WS, National Wildlife Disease Program

Wildlife Plague Surveillance in Washington Summary Report, July 2010-June 2014

Plague surveillance using serological testing of wild carnivores helps to identify areas of plague activity in Washington. This report summarizes wildlife plague surveillance activities and findings from July 2010 through June 2014.

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To obtain copies or for additional information, please contact:

Zoonotic Disease Program
PO Box 47825
Olympia, Washington 98504-7825

Phone: 1-800-485-7316
Webpage: www.doh.gov/zoonosescontact

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John Wiesman
Secretary of Health



Wildlife Plague Surveillance in Washington, 2010-2014

Plague is essentially a disease of rodents caused by the bacterium *Yersinia pestis*. It can be transmitted to people through bites of infected fleas or from handling an infected animal. The disease can cause serious illness and death when not promptly treated.

Symptoms depend on how the person was exposed to the plague bacteria. The disease can take on different clinical forms, but the most common are bubonic, septicemic, and pneumonic plague.

Bubonic Plague: Symptoms include sudden onset of fever, headaches, chills, and weakness, and one or more swollen painful lymph node. Bubonic plague is the most common form of the disease, and is usually the results of an infected flea bite.

Septicemic Plague: Symptoms include fevers, chills, extreme weakness, abdominal pain, shock, and possibly bleeding into the skin and other organs. Skin and other tissue may turn black and die, particularly on fingers, toes and the nose. Septicemic plague can occur as the first symptoms of plague, or may develop from untreated bubonic plague. This form results from bites of infected fleas or from handling an infected animal.

Pneumonic Plague: Symptoms include fever, headache, weakness, and a rapidly developing pneumonia with shortness of breath, chest pain, cough, and sometimes bloody or watery mucous. Pneumonia plague may develop from inhaling infectious droplets or may develop from untreated bubonic or septicemic plague after the bacteria spreads to the lungs. The pneumonia may cause respiratory failure and shock. Pneumonic plague is the most serious form of the disease, and it can be spread from person to person.

According to the CDC, in recent decades, an average of seven human plague cases has been reported each year in the United States. Cases typically range from 1 to 17 per year. Most infections occur in the southwestern states of Arizona, Colorado, New Mexico, and Utah, and in western states of California, Oregon, and Nevada.

Washington's reported history of human plague began in 1907, when three (possibly seven) people died in Seattle. Since then, only one human case has been reported. This case occurred in Yakima County in 1984 and involved a trapper who most likely acquired the disease after cutting himself while skinning an infected bobcat. With prompt medical attention, the trapper recovered without incident.

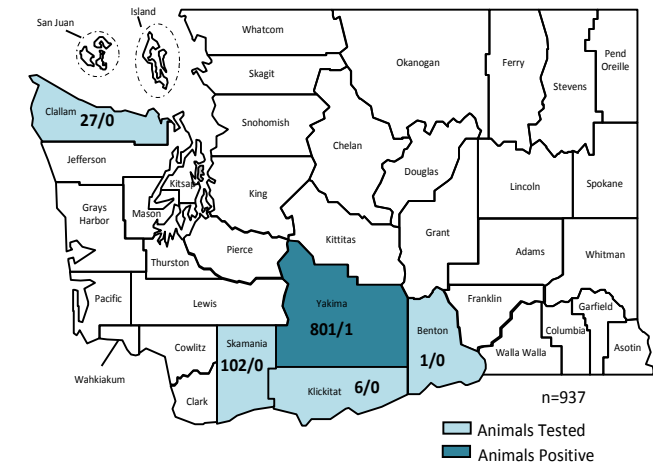
Surveillance Activity and Findings

The Zoonotic Disease Program, working in conjunction with the CDC, conducts serologic surveys of wildlife, primarily wild carnivores that feed upon rodents, to monitor the prevalence of plague in the state. Surveillance enables state health officials to alert local health departments to initiate and focus control and prevention efforts in communities where elevated plague activity is detected in local wildlife. It allows for timely health advisories to health care providers and veterinarians to be vigilant for signs of the disease, and to local residents about the risk and prevention of human plague. In addition,

state plague surveillance data are shared with the U.S. Department of Agriculture-National Wildlife Disease Program who maintains a comprehensive national wildlife plague surveillance system with the objective of developing a better understanding of pathogen ecology.

Wildlife plague surveillance involves the collection of animal blood samples dried on Nobuto filter-paper strips. Surveillance tracks sample collections by season, which runs from July through June to correspond with the trapping season. Over the past two seasons, July 2010 through June 2014, 937 samples from Washington State were submitted to the CDC for plague serology. The Yakama Nation Wildlife Department contributed the majority (799) of these samples. Other surveillance partners include Washington State Department of Fish and Wildlife’s licensed nuisance trappers, who collected 108 samples, Makah Tribe Forestry-Wildlife Division, (27) and Joint Base Lewis-McChord Yakima Training Center, (3). The majority (802) of the samples was collected from coyotes, which are a good sentinel species for plague exposure. Additionally, other species were sampled including bobcat (18), cougar (8), short-tailed weasel (2), otter (1), raccoon (1), skunk (6), opossum (2), jack rabbit (3), and rodents (94). Samples were collected in five counties: Benton (1), Clallam (27), Klickitat (6), Skamania (102), and Yakima (801).

Figure 1. Distribution of animals tested for plague by county, Washington, July 2010-June 2014



One sample collected in August 2012 tested positive for antibodies against *Y. pestis*. The positive sample was from a coyote in Yakima County indicating that a past exposure occurred to plague. Figure 1 shows the distribution of animals tested and positive for plague exposure by county for the 2010-2014 surveillance seasons.

Since 1975, 28 seasons of wildlife plague surveillance have been conducted in Washington. State coverage of plague surveillance depends largely upon participating surveillance partners and their collections; therefore, coverage has fluctuated over the years. Historically, the majority of specimens have been collected from animals in eastern Washington.

Figure 2. Distribution of animals tested for plague by county, Washington, July 1975-June 2014

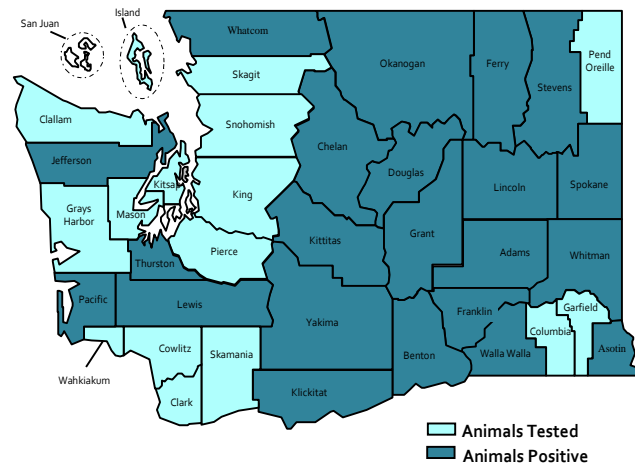


Figure 2 shows the distribution of animals tested and those that tested positive for plague by county from July 1975 through June 2014. With the exception of San Juan County, specimens have been collected from

animals in each county of the state. Over this time period, plague activity has been detected in 22 counties. While the majority of plague activity has occurred in eastern counties, positive plague samples have also been detected in western counties including Jefferson, Pacific, Lewis, Thurston, and Whatcom.

Between 2005 and 2010, the U.S. Department of Agriculture-National Wildlife Disease Program in collaboration with the CDC conducted plague and tularemia surveillance in wildlife in Washington as well as other states. The primary goal of this project was to compile and analyze long-term plague and tularemia surveillance data to quantify disease patterns across the United States. In February 2011, our Program obtained the U.S. Department of Agriculture-National Wildlife Disease Program's surveillance data on 389 specimens collected from a variety of mammals—coyote (36), beaver (182), bighorn sheep (14), opossum (1), nutria (144), muskrat (8) and raccoon (4). Surveillance covered areas primarily in western Washington counties including Clallam (4 samples), Clark (161), Cowlitz (14), Grays Harbor (14), Island (12), Jefferson (4), King (1), Kitsap (1), Lewis (41), Mason (5), Pacific (4), Pierce (3), Skagit (21), Snohomish (6), Thurston (6), Wahkiakum (3), and Whatcom (75). In eastern Washington, during studies of bighorn sheep populations, convenience samples were collected from herds in Kittitas (11) and Yakima (3) counties. No positive samples were identified.

The following tables summarize the findings of wildlife plague surveillance efforts conducted by our Program and the U.S. Department of Agriculture-National Wildlife Disease Program. Table 1 presents a county comparison of specimens tested, positive, and percent positive submitted by the Program, July 2010-June 2014. Additionally, the table shows a county comparison of long-term surveillance, July 1975-June 2014 which includes the U.S. Department of Agriculture-National Wildlife Disease Program surveillance data. Over this time period, surveillance showed higher plague prevalence ($\geq 5\%$) in central eastern Washington counties, including Kittitas (12.84%), Douglas (8.70%), Lincoln (7.95%), Okanogan (6.70%), Chelan (6.15%), and Grant (4.65%) than in other counties of the state. Statewide, 227 (2.58%) of 8,787 samples have tested positive for antibodies against *Y. pestis*.

Table 2 displays a comparison of surveillance seasons, July 1975-June 2014, of all samples tested, the number testing positive, and percent positive submitted by the Program and the U.S. Department of Agriculture-National Wildlife Disease Program. The table also provides the number of coyote specimens tested, the number testing positive, and percent positive by surveillance season. Over the seasons, 162 (2.43%) of 6,672 coyote have tested positive for plague antibodies.

In conclusion, the prevalence of plague among wildlife remains relatively low in both eastern and western Washington. Long-term wildlife plague surveillance indicates that roughly 2.5 percent of wild carnivores were exposed to plague-infected rodents, and that naturally occurring plague continues to be endemic in Washington.

Future wildlife plague surveillance depends on securing long-term partners who trap or hunt carnivores, particularly coyotes, and are willing to submit samples. To expand and enhance surveillance, it is important to broaden recruitment of partners across the state. The Department of Health continues to recruit hunter volunteers and supply them with test kits as a way to expand the geographic range of our data.

Table 1. Samples tested, positive, and percent positive for plague by county, Washington, July 2010-June 2014 and July 1975-June 2014

Surveillance Season*	2010-2014			1975-2014		
	Number of Samples			Number of Samples**		
County	Tested	Positive	% Positive	Tested	Positive	% Positive
Adams				269	2	0.74
Asotin				38	1	2.63
Benton	1	0	0	102	3	0.98
Chelan				65	4	6.15
Clallam	27	0	0	96	0	0
Clark				175	0	0
Columbia				13	0	0
Cowlitz				78	0	0
Douglas				161	14	8.70
Ferry				165	5	3.03
Franklin				237	3	1.27
Garfield				1	0	0
Grant				215	10	4.65
Grays Harbor				97	0	0
Island				60	0	0
Jefferson				62	1	1.61
King				155	0	0
Kitsap				36	0	0
Kittitas				148	19	12.84
Klickitat	6	0	0	40	1	2.50
Lewis				95	1	1.05
Lincoln				503	40	7.95
Mason				23	0	0
Okanogan				911	61	6.70
Pacific				28	1	3.57
Pend Oreille				62	0	0
Pierce				49	0	0
San Juan	<i>No samples collected</i>					
Skagit				54	0	0
Skamania	102	0	0	132	0	0
Snohomish				16	0	0
Spokane				96	1	1.04
Stevens				161	2	1.24
Thurston				35	1	2.86
Wahkiakum				14	0	0
Walla Walla				70	2	2.86
Whatcom				259	3	1.16
Whitman				738	2	0.27
Yakima	801	1	0.12	3,327	50	1.50
Unknown				1	0	0
Washington	937	1	0.11	8,787	227	2.58

* A typical surveillance season runs July 1 through June 30

**Includes United States Department of Agriculture, Wildlife Disease Program Surveillance

Table 2. All samples and coyote samples tested, positive, and percent positive for plague by surveillance season, Washington, July 1975-June 2014

Surveillance Season*	Number of All Samples			Number of Coyote Samples		
	Tested	Positive	% Positive	Tested	Positive	% Positive
1975-1976	409	2	0.49	248	1	0.40
1976-1977	283	0	0	247	0	0
<i>No surveillance - July 1977 through June 1978</i>						
1978-1979	363	18	4.96	282	13	4.60
1979-1980	295	12	4.07	177	7	3.95
1980-1981	433	15	3.46	284	7	2.46
1981-1982	812	52	6.40	597	33	5.53
1982-1983	538	44	8.18	421	40	9.50
1983-1984	384	21	5.47	311	16	5.14
1984-1985	404	21	5.20	291	17	5.84
1985-1986	341	7	2.05	225	6	2.67
1986-1987	236	8	3.39	164	4	2.44
1987-1988	142	2	1.41	89	2	2.25
<i>No surveillance - July 1988 through June 1997</i>						
1997-1998	97	2	2.06	70	2	2.86
1998-1999	151	5	3.31	118	4	3.39
1999-2000	92	12	13.04	50	4	8.00
2000-2001	183	3	1.64	151	3	1.99
2001-2002	123	2	1.63	108	2	1.85
<i>No surveillance - July 2002 through June 2003</i>						
2003-2004	153	0	0	144	0	0
2004-2005	261	297	0	202	0	0
	**USDA 36					
2005-2006	257	492	0	235	0	0
	USDA 235					
2006-2007	403	470	0	396	0	0
	USDA 67					
2007-2008	421	442	0	433	0	0
	USDA 21					
2008-2009	360	0	0	359	0	0
2009-2010	320	348	0	268	0	0
	USDA 28					
2010-2011	321	323	0	243	0	0
	USDA 2					
2011-2012	202	0	0	168	0	0
2012-2013	264	1	0.38	249	1	0.40
2013-2014	150	0	0	142	0	0
Cumulative	8,787	227	2.58	6,672	162	2.43

* A typical surveillance season runs July 1 through June 30

** USDA-United States Department of Agriculture, Wildlife Disease Program Surveillance

