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The Great Epizootic of 1872–73: Networks of Animal Disease in North American Urban Environments

Abstract

This article examines the outbreak of an unknown illness (later thought to be equine influenza) among the horses of Toronto and its subsequent spread as a continent-wide panzootic. Known as the Great Epizootic, the illness infected horses in nearly every major urban center in Canada and the United States over a 50-week period beginning in late September 1872. The Great Epizootic not only illustrated the centrality of horses to the functioning of nineteenth-century North American cities, but it also demonstrated that these cities generated ecological conditions and a networked disease pool capable of supporting the rapid spread of animal disease on a continental scale in localities from widely divergent geographies. This article invites environmental historians to broaden their view of cities to consider the ways in which networked urbanization produced forms of historical biotic homogenization that could result in the rapid and widespread outbreak of disease.

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Not a sound was heard in the silent street,
As home from the concert we hurried;
For we found not a street car, carriage or 'bus,
And we felt considerably worried.

We hailed a driver we used to know
And hurriedly asked the reason;
He said, as he sadly shook his head,
That the horses were all a sneezin'[1]

INTRODUCTION

In early October 1872, a mysterious illness swept through the urban horse population of Toronto. The *Toronto Globe* first reported it on October 5, 1872, noting that "[f]or some time past a large number of horses in the city have been affected with disease of the respiratory organs, but during the present week another disease has prevailed to an alarming extent among the horses in this district." Horse owners and other observers were perplexed. Horses throughout the city suffered from hacking coughs and fatigue that kept them from working for more than two weeks. According to Dr. Andrew Smith of the Ontario Veterinary College, it was a "considerable loss and annoyance to owners of horses and to the community generally." In the early days of this outbreak, no observers could foresee how widespread and disruptive this disease would prove.[2]

The outbreak of disease among the horses of Toronto in the autumn of 1872 was the beginning of what came to be known as the Great Epizootic. Following the events in Toronto, the disease (which contemporaries believed to be a form of equine influenza) spread throughout North America from the Atlantic to Pacific coasts and into parts of Central America. It was, as David M. Morens and Jeffery K. Taubenberger describe, "The most explosive equine panzootic ever documented."[3] Everywhere it went, the disease brought cities to a halt, vividly demonstrating urban North America's dependence on equine power.[4] It temporarily suspended transport, trade, and commerce. It was partially responsible for the infamous fire that consumed Boston in November 1872 because fire equipment stood dormant without the labor of horses. It slowed voters on the eve of the reelection of President Ulysses S. Grant. It even inspired bad poetry.

The Great Epizootic not only illustrated the centrality of horses to the functioning of nineteenth-century North American cities, but it also demonstrated that these cities generated ecological conditions and a networked disease pool capable of supporting the rapid spread

of animal disease on a continental scale in localities from widely divergent geographies. Just as crowd diseases like cholera, typhoid, and smallpox ravaged human residents of cities, so too could diseases strike the dense populations of urban horses of the nineteenth century. Every city the epizootic visited experienced common symptoms: a sudden and thorough spread of incapacitated horses with oozing nostrils and hacking coughs, suspended street railway service and local deliveries, temporary shortages of food and other supplies, price gouging, and an inability to arrest the spread of the illness.

The disease found ideal conditions in the 1870s: cities filled with thousands of horses kept in cramped, crowded stables. Moreover, it continuously discovered new vulnerable hosts in similar environmental conditions by traveling along railroads and other transportation linkages into new hospitable environments. Horses were the predominant mode of intraurban transportation in nineteenth-century cities and lived by the thousands clustered in stables from Montreal to New York City to Galveston. Humans continuously shipped horses by rail from city to city to resupply demand for equine traction. No large city in 1872–73 relied on any other domestic animals for transportation and other labor more than the horse.[5] Ann Norton Green contends that the horse occupied the niche of fractional power as the prime mover of nineteenth-century America, complementing steam engines.[6] In turn, the preeminence of the urban horse created a niche for the disease that flourished during the epizootic.[7]

The case of the Great Epizootic invites environmental historians to broaden their view of cities to consider the ways in which networked urbanization produced forms of historical *biotic homogenization*. I borrow this term from urban ecologists who have studied the ways in which urbanization produces common ecological outcomes around the world.[8] Biotic homogenization can be observed historically in nineteenth-century urban environments and can help to explain how the Great Epizootic flourished in cities across the continent. For many years now, urban environmental historians have approached cities as ecosystems, rejecting the boundaries between built environments and natural environments. Martin V. Melosi is most explicit in this regard resisting what he calls "the nature/built environment nexus," a belief in a natural world that excludes humans and a separate artificial world. Instead, he contends that cities are a part of natural ecosystems, not unlike the constructed habitats of other species, such as prairie dogs or oysters. "Viewing cities as ecosystems," Melosi suggests, "helps to connect urban places to the rest of the physical world, not isolate them as inherently artificial."[9] Indeed, urban environmental historians have looked beyond the boundaries of the city to highlight the interconnections and exchanges between city and countryside.[10] Urban environments, however, were more than

discrete ecosystems built solely on metabolic exchanges with regional hinterlands. They also shared ecological characteristics and, in some regard, held more in common with one another than their adjacent rural environments.[11] Recent work in urban environmental history with a focus on urban-adapted flora and fauna points to the need for further studies of the interconnections among urban environments and the processes of historical biotic homogenization that came to characterize the development of cities.[12] By the late nineteenth century, North American cities were networked ecosystems with common characteristics and the capacity to behave as unified disease pools for both animals and humans.

Despite local biogeographic differences, nineteenth-century cities in both Canada and the United States shared some common ecological characteristics and structures including the role of the horse for transportation and other work. Cities constituted habitat for large numbers of humans and livestock animals. As many historians have shown, people across the industrialized world of the nineteenth century depended on the labor and bodies of horses, cattle, pigs, sheep, and chickens to build the enormous urban centers that drove economic development.[13] As Frederick L. Brown puts it, "the city is more than human."[14] Across a vastly diverse biogeographic range, humans with the aid of a common assemblage of livestock animals transformed different environments into industrial cities in the nineteenth century and produced some shared ecological characteristics. One of the most common characteristics across Canadian and US cities was that they accommodated large populations of horses, supplying them with stables, bedding, feed, and water. To be sure, cities across North America were not ecologically identical and, of course, retained specific environmental idiosyncrasies and differences. Nevertheless, they shared some general ecological characteristics in terms of the relationships among similar compositions of domestic animal species and humans. Those common characteristics left North American cities vulnerable to the outbreak of disease that swept the continent in 1872–73.

The historical study of urban environments as networked ecosystems can be aided by the application of a geographic information system (GIS) as both a tool for visualization and a methodology for historical analysis. GIS integrates, analyses, and displays spatial information. It can also reveal geospatial relationships and patterns. For historians, this includes patterns of change over time. "It is a means of doing research," writes Richard White. "It generates questions that might otherwise go unasked, it reveals historical relations that might otherwise go unnoticed, and it undermines, or substantiates, stories upon which we build our own versions of the past."[15] As Jennifer Bonnell and Marcel Fortin note, "historical GIS takes the power of geographic analysis and applies it to the realm of historical

research."[16] Mapping historical spatially referenced information can illuminate relationships that cannot easily be observed or understood absent geographic visualization. GIS, therefore, can be used to better understand geographically widespread ecological phenomena that linked urban environments across Canada and the United States in the past.

This article examines the origins of the Great Epizootic and its effects on urban environments in North America in 1872–73 as it spread outward from Toronto to nearly all the major cities of Canada and the United States including Montreal, Detroit, Chicago, New York City, Boston, Philadelphia, Baltimore, New Orleans, Galveston, and San Francisco. It begins by using historical GIS methods to map and analyze the initial outbreak of the disease in Ontario in the autumn of 1872 and follows its spread throughout the continent. Using extensive newspaper records and other local accounts, it then shows the common characteristics of the epizootic and the responses to its presence as it was experienced in numerous cities across Canada and the United States.

MAPPING THE OUTBREAK

The Great Epizootic, or as it was sometimes called, the "Canadian horse distemper," began outside of the city of Toronto in late September 1872, possibly originating on farms in the townships of York, Scarborough, and Markham. Andrew Smith reported that he first started to treat horses in Toronto for the illness on September 30 when he found fourteen sick horses in one city stable. Smith then claimed that the disease "ran through the city with remarkable rapidity, sparing scarcely a single animal of this noble species." Local newspapers picked up on the story as early as October 5 as the disease began to work its way through Toronto's urban horse population. The *Toronto Leader* was one of the earliest newspapers to recognize that "An epidemic or if not an epidemic, something very like one appears to be spreading amongst the horses of this city just now." It noted, however, that the illness was not too severe, and "Fortunately it has not for the present developed itself in such a way as to cause any alarm."[17] This initial optimistic response to the epizootic would become common in nearly every city it occurred. The complacency of these early reports, however, did not last.

The disease continued to spread and infect most of Toronto's horses, which, according to the 1871 census, totaled nearly two thousand. As with other late nineteenth-century industrial cities, equestrian power drove Toronto's economy. Within the first few days of the outbreak, Dr. Smith, one of three veterinary surgeons in the city, was inundated with patients, tending to more than six hundred cases,

according to early reports. By October 7, the epizootic was out of control. The *Toronto Mail* claimed that by the end of the first week of October, "the disease has attacked hundreds of the animals," and that "The epidemic is not confined to any particular stable, but has appeared in all the large ones in the city." These included facilities of all the major livery stable operators and the Toronto Street Railway Company. The following day, the *Toronto Mail* reported that "This distressing disease continues unabated, and scarcely a horse in the city has escaped." Rescinding its previous conclusion that the disease should cause no alarm, the editors of the *Toronto Leader* admitted, "nearly every other horse is affected by it. Coughing and sneezing will be heard continually from the poor animals, and general symptoms seen of a kind of influenza." Reporters went so far as to describe Toronto as a "vast hospital for diseased horses." Something very serious had indeed occurred in Toronto, and it soon spread outside the borders of the city.[18]

The Great Epizootic moved like a fire, burning most fiercely wherever it found ample fuel in the form of horse bodies and a means of reaching those bodies, usually via railroads. The enormous volume of newspaper coverage makes it possible to retrace and map the pathways of the disease (figure 1).[19] This account of the movement of the Great Epizootic and the accompanying maps were generated from a large-scale historical GIS project. Local newspapers, veterinary reports, and subsequent analysis by sanitary engineers provide a base of historical evidence that can be geospatially and temporally referenced in a simple map. These records offer the best evidence of the first appearance of the epizootic in each locality, allowing historians to track the movement of the disease as it spread outward from Toronto over the weeks and months after October 1872.[20] I placed this evidence in a GIS data table, featuring both geographic and time-date fields (available at http://hdl.handle.net/10315/32929). Based on analysis of over 480 newspaper accounts and reports published between 1872 and 1873, the epizootic appeared in 164 Canadian and US cities and towns, affecting nearly all horses, according to firsthand observations.[21]

GIS analysis of the geospatially and temporally referenced historical evidence reveals the general westward movement of the epizootic as it infected horses in Canadian and US cities. The inclusion of additional layers featuring Canadian and US railroad networks allows for analysis of spatial relationships between the epizootic and rail transport.[22] The disease moved most rapidly and flourished in the dense urban environments of the Northeast where it infected thousands of previously unexposed, dense clusters of horses linked together by railroads. As the disease traveled south and west into more sparsely settled rural states and territories, its movement slowed. Populations of urban horses were less plentiful, more dispersed, and connected by

fewer railroad lines. When it reached the American Southwest and Utah, it nearly vanished from all records with no newspapers reporting cases until the disease reemerged in Nevada and California in the early months of 1873.

Geographic evidence shows that the epizootic traveled rapidly along the extensive North American railroad network. By 1872 railroad corporations were in the midst of a bonanza of development. According to Richard White, "the railroad network expanded rapidly following the [Civil War], more than doubling in the United States, from 35,085 miles in 1865 to 70,784 in 1873, with peak building between 1870 and 1872."[23] Although not as extensive as the US network, railroad development had grown considerably in Canada since the 1850s. The most significant line was the Grand Trunk Railway, which by 1860 traveled from Sarnia, Ontario, through to Toronto and Montreal with a connection south to Portland, Maine.[24] Enthusiasm for the construction of railroads was spurred, in part, by the completion of the Union Pacific Railroad, the first so-called transcontinental in 1869. The Union Pacific met with the Central Pacific in Utah in May 1869, completing a line from California to Iowa that could connect to the existing railroad network in the Northeast, bridging cities across the United States from the Atlantic to the Pacific. The Great Epizootic broke out on the heels of this extraordinary wave of railroad development.

Railroads sped the epizootic from city to city "faster than the fleetest horse could gallop," according to one newspaper report. It spread more rapidly than any animal disease previously documented in North America. Dr. Duncan McEachran, a leading veterinary surgeon and founder of the first school of veterinary medicine in Quebec, reported that he had attended to the first case of equine influenza in Montreal on October 8, only one week following the first reported cases in Toronto. Within less than a month, the disease was reported to have spread to Boston, New York City, Philadelphia, Baltimore, and Chicago.[25]

While railroads "annihilated" time and space, as some scholars have argued, Richard White shows how they did so "unevenly and chaotically."[26] Railroads connected regional metropolises to one another and to their hinterlands, following a market logic rather than a geographic logic. Topography, watercourses, and other geographic features certainly influenced railroad construction, but engineers were still able to break free from those constraints, cutting direct lines, linking market centers with spurs to smaller nodes on the network. The Great Epizootic followed these pathways.[27]

For example, when the disease crossed the international border at Niagara around October 13, it appeared among the horses of Buffalo and Rochester. Within one week, the epizootic rapidly moved eastward and struck several large urban centers on the Atlantic seaboard

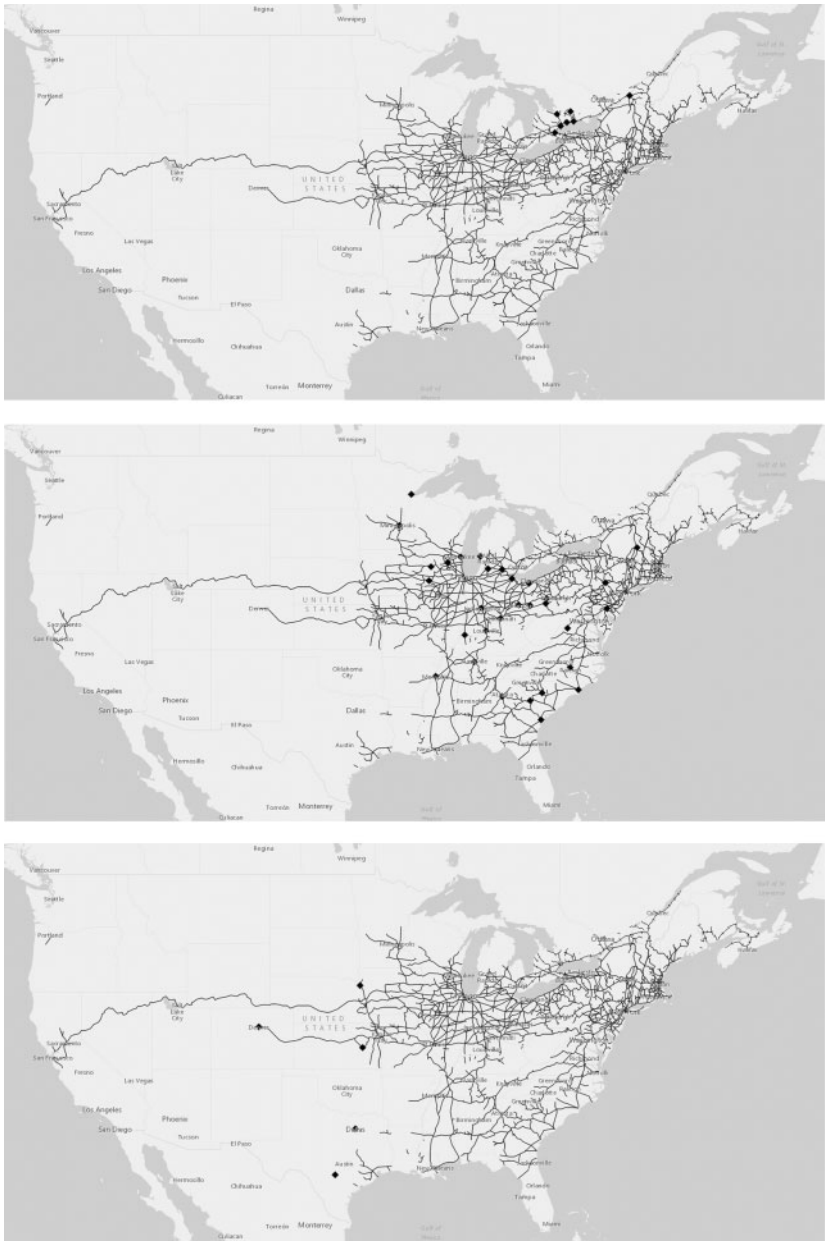

Figure 1. Progressive map of cities reporting arrival of epizootic, 1872–73, and railroad network. Left side, from top: September 29 to October 13, 1872; November 9 to 23, 1872; December 21, 1872, to January 4, 1873. Right side, from top: February 1 to 15, 1873; March 16 to 30, 1873; April 13 to 27, 1873. To view an interactive version of this map with additional date ranges and source information for each city, visit http://bit.ly/greatepizootic. Credit: Sean Kheraj, 2018.

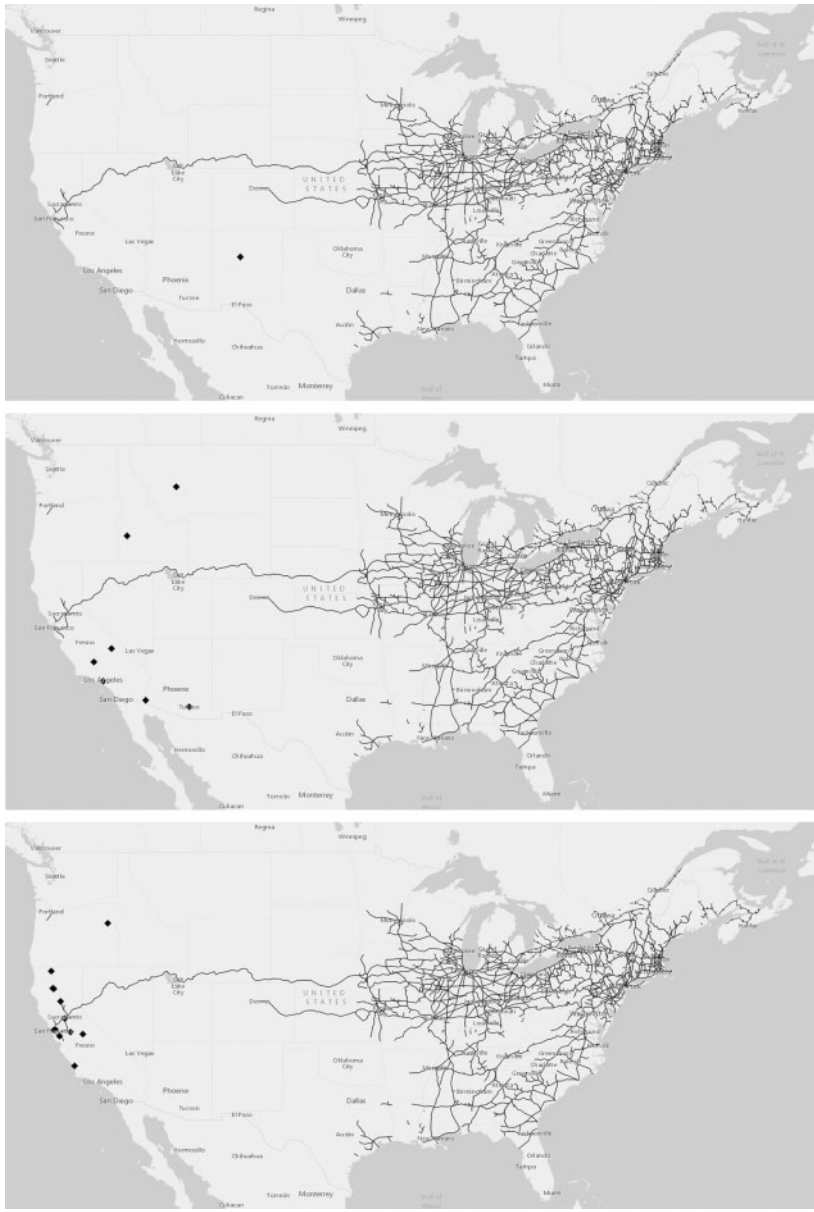

Figure 1.Continued.

including New York City, Boston, Philadelphia, and Baltimore. The following week, the disease radiated away from the coast back inland to the smaller cities and towns it had passed on its way to the major metropolitan centers of the Northeast.[28] The Great Epizootic did not

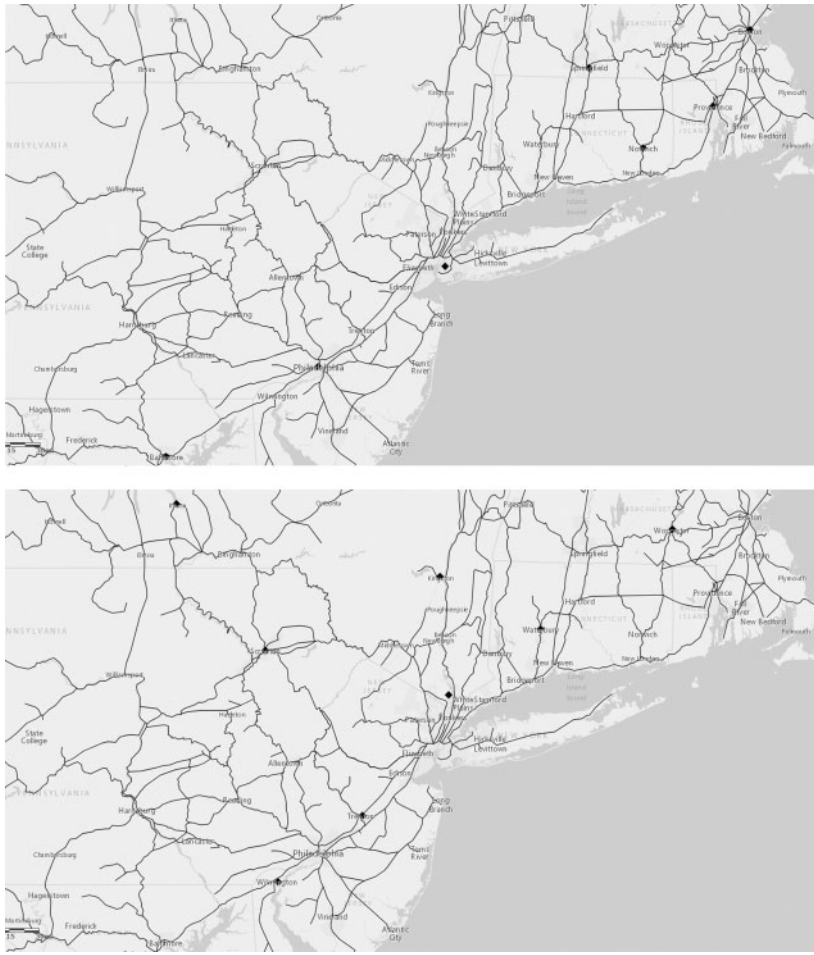

Figure 2. These maps show cities reporting the arrival of the epizootic from October 20 to October 27, 1872 (top), and from October 27 to November 16, 1872 (bottom). It first struck large metropolitan centers on the coast and then appeared inland in smaller cities and towns. Credit: Sean Kheraj, 2018.

spread evenly across the continent. It moved between metropolitan centers and radiated out to smaller cities and towns in a manner that followed the pattern of railroad traffic (figure 2).

Railroads sped movement from city to city in North America, but they were not entirely free from natural constraint. As Mark Fiege contends, the railroad "was embedded in nature." Winter was still a considerable obstacle to railroad traffic in the 1870s. The Union Pacific was vulnerable to snow and ice. The winter of 1871–72 was especially troublesome, causing the line to close for over a month. The movement of the Great Epizootic shows evidence of similar

limitations. After reports of the arrival of the disease in Utah in the third week of January 1873, the movement of the epizootic stalled for several weeks. It did not appear again until reports of its effects on Sacramento in March. Constraints on railroad travel during the winter may have momentarily halted the epizootic.[29]

The movement of the disease across Canada further illustrates the degree to which the railroad network influenced the course of the epizootic. By 1872 Canadian cities and towns were not yet linked by a single national railroad network. They were integrated into a railroad network with American cities in a manner that followed a north-south axis rather than an east-west axis. For instance, the epizootic appeared among the horses of St. John, New Brunswick, two to three days prior to the arrival of the disease in Quebec City, suggesting that the disease traveled to New Brunswick via Maine rather than Quebec. Quebec City and St. John were not yet connected by a railroad. Portland, however, had closer railroad linkages to New Brunswick. While Quebec City was geographically closer to Toronto, St. John experienced the epizootic first, likely due to its railroad connections to Maine. Further GIS analysis reveals that the epizootic likely crossed the international border five times back and forth between Canada and the United States. It first crossed at Niagara from Ontario into New York. It then crossed into Michigan from Ontario. As the disease spread throughout the United States, it traveled back north into Manitoba in January 1873 and returned once more from Washington into British Columbia by September 1873.[30]

In 1873 two contemporary veterinary and sanitary researchers reached similar conclusions regarding the relationship among horses, railroads, and cities as a result of geographic analysis of the epizootic. Dr. James Law, the first head of veterinary medicine from Cornell University, and Adoniram Judson, assistant sanitary inspector for the City of New York, each published extensive reports on the epizootic and its causes. Both studies used epidemiological methods and geographic analysis to support the conclusion that the disease was caused by a communicable contagion (rather than prevailing atmospheric conditions) and was carried from city to city via railroads and other transportation linkages.

Both Law and Judson published their findings at a time when contagionist and anticontagionist theories of the spread of epidemics were still in competition among medical experts.[31] While many veterinarians accepted that most epizootics were contagious and spread by some kind of disease agent, anticontagionist theories remained popular in North America among some veterinary professionals and laypeople. Anti-contagionist explanations for epidemics and epizootics included both the Hippocratic idea of broad atmospheric influences and the localized miasmatic or filth theory that attributed disease to airs poisoned by the decomposition of animal and plant

matter.[32] Linda Nash showed that even with the emergence of new germ theories of disease, in some instances, contagionist and anticontagionist theories of disease dissemination coexisted and comingled in both medical and popular thought.[33] Nevertheless, these two reports drew from geographic insights to support contagionist conclusions about the spread of the Great Epizootic.

James Law published a lengthy study of the epizootic in the 1872 annual report of the US commissioner of agriculture. In that study, Law outlined an exhaustive list of the different anticontagionist environmental theories for the origin and dissemination of the epizootic including atmospheric ozone, overcrowding, variability of weather, excessive rainfall, unusual humidity, "the telluric emanations attendant on great earthquakes and volcanic eruptions," and atmospheric electricity. He concluded, however, that "The epizootic of 1872 affords but the slenderest appearance of support to any of these hypotheses." Instead, he found a contagionist explanation: "The only theory that will accord with the history of the malady and its steady increase and extension is that which recognizes the existence of a *contagion*, capable, like other specific disease poisons, of assimilating its appropriate food, of reproducing its elements, and of thereby increasing the area of the disease."[34]

Law reached these conclusions because of the geographic spread of the epizootic. He noted that the disease did not move evenly across the continent but instead appeared sporadically in urban centers along primary lines of communication. Railroads linked horses in major cities across Canada and the United States allowing the disease to spread from one place to the next. "Not only do we find a tendency to follow the great lines of rail," Law observed, "but in many cases a temporary avoidance of many of the small towns on the track, whose commercial relations are less active, and their danger of infection correspondingly small." Wherever the disease spread, he contended, "Most of these were instances of the appearance of the disease in an entirely new locality, far beyond the limits of the region formerly pervaded by the disorder, and from such new points the infection spread widely before the general country, or even many of the towns in the interval between this and the former disease area were involved." Examining how the disease moved from one city to the next led Law to conclude that its path was forged by some form of contagion.[35]

Law's analysis was later supported by the detailed geographic research of Adoniram Judson. Judson tirelessly compiled newspaper evidence and firsthand accounts from veterinary surgeons and US consular representatives from nearly all the infected towns and cities of North America. He presented his research at the first meeting of the American Public Health Association in 1873 and argued, "Epizoötic influenza does not spread by virtue of any of the recognized atmospheric conditions of cold, heat, humidity, season,

climate, or altitude … The disease prevailed and was propagated in the cold of a northern winter, and in the summer heat of Central America; in the dry air of Minnesota, and in the moist air of the seaboard; at an altitude of 5,000 feet above the sea, at Saltillo, Mexico, and on the low levels of New Orleans, La. (ten feet above sea-level), and Galveston, Texas (five feet above sea-level)."[36] His extraordinary map, he believed, was "logical proof that epizoötic influenza spreads by virtue of its communicability, that no place was exempt from the disease which was known to have been in communication, by means of horses or mules, with places in which the disease existed" (figure 3). Geospatial analysis of the movement of the Great Epizootic reveals the extent to which the railroad network linked the bodies of horses from city to city and created a unified disease pool capable of transmitting a highly contagious animal disease in a rapid fashion across vast distances. The horses in San Francisco were biologically vulnerable to the health conditions of horses as far away as Toronto.[37]

EPIZOOTIC SYMPTOMS AND EFFECTS ON CITIES

Observers could identify the Great Epizootic both by its effects on horses and its effects on cities. As the epizootic jumped from city to city across Canada and the United States, it resulted in similar disruptive experiences wherever it went because of the historical biotic homogenization that had created common ecological conditions in North American cities. The symptoms of the outbreak went beyond the biological effects on horses and their bodies. Cities themselves experienced common symptoms of disruption to the ordinary functions of urban life. Thousands of densely packed horses living and working in crowded and often unsanitary conditions offered rich pasturage for the mysterious disease that swept urban North America in 1872–73.

Across North America, the horse was a constant central figure of urban life, a biotic common denominator of urbanization. According to Clay McShane and Joel Tarr, "Historians have largely neglected the tremendous influence of the horse," an animal they argue was "a shaper of cities." In the nineteenth century, horses lived and worked in large numbers in all cities in Canada and the United States. According to Ann Norton Greene, in the late nineteenth century, "Horses powered almost every aspect of urban life." Their populations were concentrated in cities and flourished with the rapid urban growth of the late nineteenth century. Green estimates that urban herds grew 50 percent faster than human populations in cities.[38] Horses filled the streets, pulling streetcars, wagons, and other vehicles. These vast teams of urban horses often labored under difficult circumstances and lived in crowded, unhealthy, and unsafe conditions. McShane and Tarr illustrate this point by drawing attention

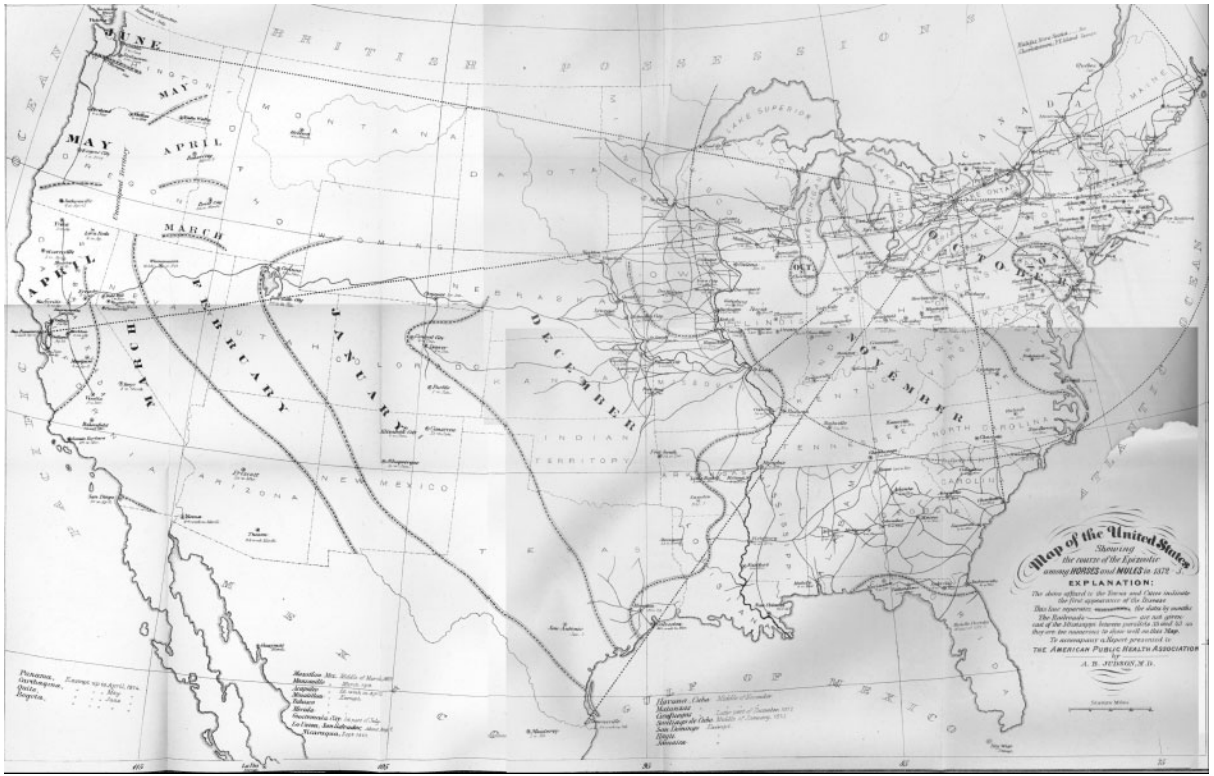

Figure 3. Adoniram Judson's map of the spread of the epizootic, 1873. Credit: Adoniram B. Judson, "History and Course of the Epizootic Among Horses upon the North American Continent in 1872–73," *American Public Health Association Reports* 1 (1873).

to the devastating New York fire of 1887 that killed 1,185 draft horses that slept in the three-story stable of the Belt Line Street Railway. "Stables were perhaps the weakest link in the system," they write, "since all-too-common stable fires and epidemics of contagious diseases, which spread as rapidly in densely populated horse stables as in densely populated human tenements, could disrupt vital power to entire neighborhoods, even entire cities."[39]

Everywhere the disease spread, the ordinary functions of city life were thrown into turmoil. The disruptive effects of the suspension of horse labor were immediately felt in Toronto at the outset of the epizootic. *The Canada Farmer* estimated that within the first two days of the outbreak "at least two-thirds of the horses in the city of Toronto became affected." It found that "The prevailing epizootic, although it must have proved of considerable loss and annoyance to horse owners and the community generally, from animals being unfit to do their ordinary work in a proper manner, yet has not been attended with a very great fatality." Such horses exhibited a series of common symptoms, including discharges from the nostrils and eyes, a hacking cough, general exhaustion, and an inability to work. Those common symptoms and the images of sick horses were so ubiquitous they became the subject of satire, as in the case of a series of cartoons published in *Canadian Illustrated News* (figure 4). Most horse owners were thus compelled to let their animals rest. Just seven days into the outbreak, newspapers in Toronto complained that "the cabstands were deserted." Those cabdrivers who still had healthy horses started to increase their rates, taking advantage of the unusual circumstances. One reporter sarcastically alleged that "the cab-drivers and 'express' men still continue to 'turn an honest penny' by the late misfortunes of their steeds." So evident was the change in urban life that one reporter claimed that "any one taking a walk through our streets can see for himself that, in its incipient form, nearly every other horse is affected by it." From the shipment of goods to ordinary street traffic, the temporary suspension of horse labor disrupted the rhythms of nineteenth-century urban life.[40]

Newspapers in nearly all the cities that the epizootic struck reported similar experiences as those documented in Toronto. The first report of the arrival of the disease in Detroit claimed that the "symptoms are the same here as in Canada. A staring coat, dry and hacking cough, moving with reluctance and general dullness; nasal membranes at first pale; watery discharge from one or both nostrils; ears and legs cold."[41] A banker in New York City knew the epizootic had arrived in his stable by the observation of similar symptoms. He told a correspondent from *New York Herald*, "I found every horse I own afflicted with a husky, dry cough, and that bay Hambletonian that I drive on the lane, for which I paid $4,000 last Fall, coughing fit to break his back."[42] When the epizootic arrived in Chicago,

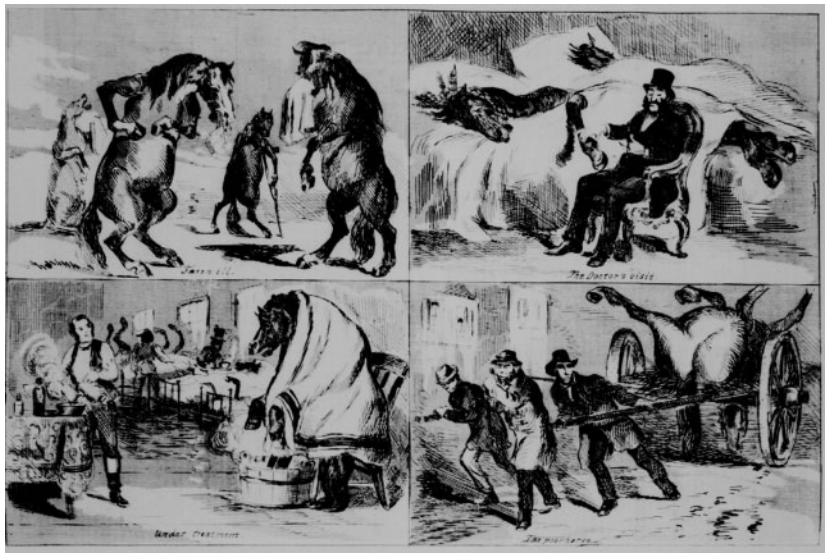

Figure 4. Illustration of the effects of the epizootic on horses. Credit: *Canadian Illustrated News*, October 26, 1872, 259.

witnesses also claimed to recognize the disease based on descriptions of the clinical symptoms reported in Toronto.[43] According to one report, "Swollen throats and running noses were bad enough; hacking coughs and refusal to eat also distressing; now utter prostration, and, in some cases, inflammation of the lungs, typhoid pneumonia, and pleurisy."[44] Through simple observation of the physical bodies of horses, people came to recognize the epizootic.

Horse owners were also able to identify the arrival of the epizootic by its rapid incapacitation of large numbers of horses. The speed and scale of the outbreak as it swept through cities became a symptom of the epizootic itself. No city affected by the disease managed to avoid its widespread dissemination. If observers were initially unsure if sick horses were indeed infected by the same disease as that which afflicted the horses in Toronto, they soon were convinced when stables reported hundreds of incapacitated animals.

In Hamilton, Ontario, initial skepticism concerning the presence of the epizootic faded following the observation of one stable that had "in the neighborhood of 200 horses now under treatment."[45] Within just three weeks of the appearance of the disease in Montreal, the *Montreal Witness* alleged that "every horse in the city has been attacked by the prevailing epizootic and that no new cases were reported from the simple fact that there are no fresh victims for the disease to attack."[46] The disease typically spread until it affected all available animals. By the time the disease hit the streets of Detroit, it

was clear that little could be done to arrest its spread once it arrived. "Horse owners," according to one description of Detroit, "have given up the idea that the equine epidemic can be checked without making the rounds of the city."[47] When the disease arrived in New York City in late October, it flared up in a predictable manner among one of the largest concentrations of horses in all of urban North America. So widespread was the illness that *New York Times* claimed that "It is almost impossible to estimate the number of horses in this City now affected by the prevailing epidemic, as it has become almost universal."[48] Some claimed that the epizootic affected nearly the entire stock of horses in New York City, "from the squalid shed that shelters the costermonger's nag to the magnificent palace where the millionaire's thoroughbreds recline at their ease, surrounded by all the luxury that wealth can purchase."[49] Within just a few days, Manhattan appeared much like Hamilton, Montreal, Detroit, and every city affected by the disease; it had become a "vast horse hospital."[50]

Even months later when the epizootic made the long westward journey to California, its presence was immediately recognized by its rapid and uncontrollable spread among horses. In Oakland, just days after reporters from the *San Francisco Chronicle* first recorded observations of sick horses in city stables, they found "The epizootic prevails in all parts of the city, and there is scarcely a horse on the streets that does not seem affected with it."[51] It spread with similar rapidity days later when it arrived across the bay. On April 18, 1873, reporters spoke with several livery stable owners who refused to acknowledge that they had any sick horses.[52] Just three days later, the *Chronicle* reported that "It was evident on Sunday that the disease, which then unmistakeably declared itself, would become pretty general, as in all other places where it has appeared, but the rapidity with which it has spread all over the city is something remarkable."[53] California reporters who had followed the disease as it raged throughout the Northeast months earlier already understood the scale of the effects of the epizootic on urban horses and quickly recognized its patterns as it spread throughout their cities. Whether it was Denver, New Orleans, Charleston, or Ottawa, the experience of the epizootic was much the same from one city to the next.

The suspension of street railway service was yet another sign that the epizootic prevailed. Equine labor powered street railway systems throughout urban North America. The epizootic was so severe in each case that it almost always shut down the streetcars. For example, in Montreal the epizootic brought ordinary traffic to a halt. The street railway system in Montreal, which relied on the labor of hundreds of horses, was suspended, and "many persons at the outskirts of the city depending upon them for conveyance have begun to show signs of impatience for the return of running."[54] Within just one week of the

outbreak in Detroit, "all the street cars, except on the Grand River avenue route, were hauled off, and many of the draymen and teamsters refused to bring out their horses."[55] One by one, the *San Francisco Chronicle* listed off the closure of street railway lines within days of the outbreak of the disease, tracking its progress by the steady closure of service.[56]

Reports on the epizootic often described the experience as a transformation of the sights and sounds of the urban environment. Accounts from Hamilton declared, "The streets of Hamilton are musical with the coughing of horses."[57] The epizootic visually transformed the streets of Quebec City where, according to a *Daily Mercury* report, "the carters' stands are nearly all deserted and seldom more than two or three horses are anywhere visible at one time in the streets."[58] *Detroit Free Press* described similar scenes, finding that within a week of the arrival of the epizootic, "The streets Saturday had a Sunday look, and such a thing as a private carriage could hardly be seen."[59] Early in the outbreak in New York City, drivers continued to try to use their horses, even as they suffered from the incapacitating effects of the disease. To some observers, such animals were "an eyesore in the streets."[60] Eventually, people were compelled to rest their horses while "Broadway and all the side parallel streets were still and empty as the ancient tombs of Egypt."[61] The epizootic dramatically altered the sights of ordinary city streets.

Perhaps the most stunning image of the epizootic was the replacement of horse labor with other animals including oxen, mules, and even people. For example, in Chicago, "In the absence of horses and vehicles, the streets were saved from utter desertion by vehicles drawn by hardy humans, or the lowing ox."[62] One report of Rochester claimed that "The streets are deserted of horses, but wagons and carts drawn by men are plenty."[63] Cleveland also turned to alternative animal power, employing teams of oxen and mules to pull its streetcars while its horses recovered.[64] In a striking expression of racial hierarchy in the American South, a correspondent for *Memphis Daily Appeal* claimed to see "wagons hauled by relays of stout colored men." The image of humans and other animals performing the work of horses strikingly subverted ordinary street life in cities.[65]

AN INDISPENSABLE AGENT IN CIVILIZATION

Within the first few weeks of the Great Epizootic, the outbreak highlighted just how crucial horses were to the economies of all North American cities and how disastrous even this rarely fatal illness had been. This common dependence on horses in North American cities left them vulnerable to a novel disease that struck this keystone species of urban transportation. As Susan Jones argues, the Great

Epizootic caused "business and transport around the city to grind to a halt."[66] Because horses provided the energy for the intraurban transportation of people and goods, the disease disrupted the metabolism of urban ecosystems with consequences for local economic activity.[67] It was a late nineteenth-century energy crisis, akin to a mass power outage or sudden fuel shortage. Reports from Boston indicated, for instance, that "The building trade is perhaps the worst off in the matter, for neither the Bay State nor the Massachusetts brick companies are able to deliver their manufactures, and the situation among the contractors is as bad as in a genuine London lock-out."[68] In New York City, the *Tribune* predicted that the epizootic would "likely prove very disastrous to commerce." It noted that shipping traffic at the wharves would grind to a halt without horse labor.[69] The same had been true in Montreal where the epizootic caused a backlog of shipping at the port. According to one account, "Thousands of tons of coal, bales, boxes, &c., await the restoration of the horses' health, and if they instead generally give up the ghost, a dead lock in all departments of the shipping trade will testify to their importance to the community."[70] As one editorial remarked, in spite of the low fatality, "Still the pecuniary loss from the stagnation of business is, perhaps, nearly as great as the actual death of the horses would be."[71]

The sudden deprivation of horse labor within urban environments disrupted economic activity in similar ways in all places the epizootic visited in 1872–73. From city to city, the disruption to ordinary horse labor caused the prices of goods and services to suddenly rise. In Richmond, Virginia, editors of the *Daily State Journal* alleged that "The horse disease is a calamity seriously affecting the business interests of the city. It is worse. It is the *excuse* for extortion." They accused carters of exploiting the epizootic by driving up prices at the expense of the economy of the city. Editors of the *Montreal Gazette* made similar accusations of "extortionate prices."[72] Out west, stagecoach companies advertised increased prices because of the epizootic.[73] Prior to the arrival of the disease in Indianapolis, residents were warned to prepare for a spike in fuel prices. The *Indianapolis Journal* advised readers "to lay in supplies of coal and wood, as there will be great suffering if not attended to in time." Newspapers in several other cities posted similar advice. In Vermont, one newspaper estimated the capital value of horses in the United States at more than $660 million. By the end of October, it argued that "The epizootic has already cost the country millions." It was clear that in the late nineteenth century, the horse was more than merely a convenience; it was a necessity of urban life no matter the city.[74]

As the disease continued to spread into November 1872, some civic boosters feared that news of the arrival of the epizootic would scare away trade and lead to a closure of ports and railroads. For example, in Savannah, Georgia, the *Morning News* tried to deny the presence of

equine influenza in the city. After sending a reporter to investigate rumors of the illness in some local stables, the conclusion was "that there's more talk than danger about this subject, and these rumors savor too much of a spirit of speculation." Despite this, the reporter did find upward of twenty sick horses in one of the city stables. Shortly afterward, the epizootic was rampant throughout Savannah. Even after the clear outbreak of the epizootic and the closure of Savannah's streetcar service, the *Morning News* tried to deny its severity and accuse neighboring cities of "endeavoring to make capital out of the prevalence of the horse disease in this city." It alleged that newspapers in Charleston, South Carolina, exaggerated the effects of the epizootic in Savannah in the hopes of diverting trade away from Georgia.[75]

Along with their critical economic roles, horses were an integral part of the lived experiences of urban North Americans, so common to everyday streetscapes that they seamlessly blended into the background. As the *Detroit Free Press* observed during the height of the epizootic, "But that the whole country was to a great extent dependent upon [horses] not only for comforts and conveniences, but for absolute necessities, it probably occurred to few to imagine. And yet the past week we have been taught pretty effectually that the horse is almost indispensable, and that even his temporary absence from his post is a serious detriment to the business of the country." The *Dubuque Herald* declared, "The horse is an indispensable agent in civilization."[76] In many ways, the Great Epizootic aroused urban North Americans to the extent to which their collective fate depended on the bodies and labor of horses.

CONCLUSION

By rail, by water, and by hoof, the Great Epizootic flowed through the North American urban network as if through blood vessels revealing the intimate material interconnections among cities that tied their ecologies together. Cities were, indeed, more than human. They were networked habitats for both humans and livestock animals, among them many thousands of horses who supplied critical labor. Whether on the streets of Boston or the streets of New Orleans, horses powered the flow of goods and people within urban environments. They also biologically linked those environments to one another. The sudden loss of that power revealed the common characteristic (and vulnerability) of North American cities as equine habitat and the transportation network that could bind cities into a single disease pool. GIS provides historians with the ability to observe these characteristics and spatial relationships.

The 1872–73 epizootic highlights the common ecological characteristics and structures of urban environments and their interconnections. While cities across North America developed in different ways with unique environments and ecological relationships, they also experienced some elements of historical biotic homogenization. As native plants and animals gave way to the growth and development of industrial cities, new urban environments were built with the support of a common set of livestock animals and soon came to support new plants and animals that thrived in human-built landscapes. Cities came to share some ecological characteristics with one another which, as the case of the Great Epizootic shows, could create opportunities for diseases to flourish.

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Notes

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1. A poem by "D. M. J." printed in the *Indianapolis Journal*, November 22, 1872, 3.
2. "Horse Epidemic," *Globe*, October 5, 1872, 1; Robert McClure, *Diseases of the Horse and Cattle and Sheep with Treatment of the Late Epizootic Influenza or "Canadian Horse Distemper" by Dr. Andrew Smith* (Toronto: A. H. Hovey, 1873), 87.
3. David M. Morens and Jeffery K. Taubenberger, "Historical Thoughts on Influenza Viral Ecosystems, or Behold a Pale Horse, Dead Dogs, Failing Fowl, and Sick Swine," in *Influenza and Other Respiratory Viruses* 4, no. 6 (2010): 331. Morens and Taubenberger also argue that the 1872 equine influenza epizootic may have a strong association with a near concurrent epizootic among pigs and chickens. See David M. Morens and Jeffery K. Taubenberger, "An Avian Outbreak Associated with Panzootic Equine Influenza in 1872: An Early Example of Highly Pathogenic Avian Influenza?" *Influenza and Other Respiratory Viruses* 4, no. 6 (2010): 373–77. It is important to note, however, that precise identification of this disease based on historical records may not be possible. Many veterinarians and other medical experts in the nineteenth century identified this disease as a form of influenza based on the observation of clinical symptoms and autopsies of deceased animals. They also referred to it as catarrhal fever. The specific character of the disease in terms of a viral agent was unknown to contemporaries. Historical evidence and contemporary accounts do suggest, however, that the

disease was highly contagious and affected nearly all horses in cities where its symptoms appeared.

4. Previous research on the Great Epizootic highlighted the degree to which the disease revealed the centrality of horses to nineteenth-century cities. These earlier studies were limited in focus to northeastern US cities and did not consider the broader continental context of urban environments. See Denise Granger, "The Horse Distemper of 1872 and Its Effect on Urban Transportation," *Historical Journal of Western Massachusetts* 11 (1973): 43–52, and James P. McClure, "The Epizootic of 1872: Horses and Disease in a Nation in Motion," *New York History* 79, no. 1 (1998): 4–22. For more on the role of horses in nineteenth-century urban America, see the work of Clay McShane and Joel Tarr, *The Horse in the City: Living Machines in the Nineteenth* Century (Baltimore: Johns Hopkins University Press, 2007), and Ann Norton Greene, *Horses at Work: Harnessing Power in Industrial America* (Cambridge: Harvard University Press, 2008).
5. Hypothetically, a city that operated mainly with the labor of oxen might have been spared from the Great Epizootic. Indeed, some cities temporarily replaced equine labor with oxen during the epizootic.
6. Green, *Horses at Work*, 6. The same is true in Canada where horses performed the same functions. See Sherry Olson, "The Urban Horse and the Shaping of Montreal, 1840–1914," in *Animal Metropolis: Histories of Human-Animal Relations in Urban Canada*, ed. Joanna Dean, Darcy Ingram, and Christabelle Sethna (Calgary: University of Calgary Press, 2017), 57–86.
7. Joanna Dean makes a complementary argument about the role of the urban horse in fostering conditions for the spread of *Clostridium tetani*, bacteria that live in the intestines of horses and spread throughout nineteenth-century cities via piles of manure and resulted in outbreaks of tetanus and lockjaw in humans. See Joanna Dean, "Species at Risk: *C. Tetani,* the Horse, and the Human," in *Animal Metropolis*, 155–56.
8. Urban ecologists have studied the common ecological characteristics of cities around the world and identified urbanization as a significant cause of biotic homogenization and ecological convergence. See, for instance, Jean-Pierre L. Savard, Phillipe Clergeau, and Gwenaelle Mennechez, "Biodiversity Concepts and Urban Ecosystems," *Landscape and Urban Planning* 48 (2000): 131–42; Michael L. McKinney, "Urbanization as a Major Cause of Biotic Homogenization," *Biological Conservation* 127, no. 3 (January 2006): 247–60; Jari Niemelä, D. Johan Kotze, and Vesa Yli-Pelkonen, "Comparative Urban Ecology: Challenges and Possibilities," in *Ecology of Cities and Towns: A Comparative Approach*, ed. Mark J. McDonnell, Amy K. Hahs, and Jürgen H. Breuste (Cambridge: Cambridge University Press, 2009); S. T. A. Pickett et al., "Urban Ecological Systems: Scientific Foundations and a Decade of Progress," *Journal of Environmental Management* 92, no. 3 (March 2011): 331–62; Peter M. Groffman et al., "Ecological Homogenization of Urban USA," *Frontiers in Ecology and the Environment* 12, no. 1 (2014): 74–81.
9. Martin V. Melosi, "Humans, Cities, and Nature: How Do Cities Fit in the Material World?" *Journal of Urban History* 36, no. 1 (2010): 10. Melosi was one of the earliest environmental historians in the United States to call attention to the need for more historical scholarship on cities and environmental protection in his 1979 article, "Urban Pollution: Historical Perspective Needed," *Environmental Review* 3, no. 3 (Spring 1979): 37–45. Melosi's body of work explores a range of issues in urban environmental history with particular emphasis on the role of infrastructure in shaping urban environments including sewage, waterworks, and garbage removal. His most critical works include *Garbage in the Cities: Refuse, Reform, and*

the Environment: 1880–1980 (College Station: Texas A&M University Press, 1981); *The Sanitary City: Urban Infrastructure in America from Colonial Times to the Present* (Baltimore: John Hopkins University Press, 2000); and *Energy Metropolis: An Environmental History of Houston and the Gulf Coast* (Pittsburgh: University of Pittsburgh Press, 2007). Other prominent work by historians that takes an ecological approach to the study of cities includes Christine M. Rosen and Joel A. Tarr, "The Importance of an Urban Perspective in Environmental History," *Journal of Urban History* 20, no. 3 (1994): 299–310; Andrew Hurley, *Environmental Inequalities: Class, Race, and Industrial Pollution in Gary, Indiana, 1945–1980* (Chapel Hill: University of North Carolina Press, 1995); Joel Tarr, *The Search for the Ultimate Sink: Urban Pollution in Historical Perspective* (Akron: University of Akron Press, 1996); and Matthew Klingle, *Emerald City: An Environmental History of Seattle* (New Haven: Yale University Press, 2007).

10. The most influential work to address the metropolitan relationship between city and countryside in the field of urban environmental history is William Cronon's *Nature's Metropolis: Chicago and the Great West* (New York: Norton, 1991). Joel A. Tarr also explores these relationships that he describes as metabolic in "The Metabolism of the Industrial City: The Case of Pittsburgh," *Journal of Urban History* 28, no. 5 (2002): 511–45.
11. This has been the finding of recent studies in macrosystems urban ecology. For instance, Philippe Cleargeau and colleagues found that urban bird communities shared more in common between the distant cities of Sydney, Australia, and Berlin, Germany, than their respective adjacent periurban environments. See Philippe Clergeau, Jukka Jokimaki, and Jean-Pierre L. Savard, "Are Urban Bird Communities Influenced by the Bird Diversity of Adjacent Landscapes?" *Journal of Applied Ecology* 38 (2001): 1122–34.
12. Recent examples include Zachary Falck, *Weeds: An Environmental History of Metropolitan America* (Pittsburgh: University of Pittsburgh Press, 2010), and Dawn Day Biehler, *Pests in the City: Flies, Bedbugs, Cockroaches, and Rats* (Seattle: University of Washington Press, 2013). Both Falck and Biehler examine the histories of species adapted to human-built environments or synanthropes, plants, and animals that have thrived across urban North America. Etienne Benson analyzes a similar phenomenon in the case of squirrels in "The Urbanization of the Eastern Gray Squirrel in the United States," *Journal of American History* 100, no. 3 (2013): 691–710. These studies provide historical insights into some of the processes of historical biotic homogenization that urban ecologists study today.
13. The scholarship on the history of urban animals now includes a wide range of case studies from North America, Europe, and Australia. In nearly all case studies, historians emphasize the centrality of urban livestock to the development of cities, especially horses. Examples include Chris Philo and Chris Wilbert, *Animal Spaces, Beastly Places: New Geographies of Human-Animal Relations* (London: Routledge, 2000); Jennifer Mason, *Civilized Creatures: Urban Animals, Sentimental Culture, and American Literature, 1850–1900* (Baltimore: Johns Hopkins University Press, 2005); Andrea Gaynor, *Harvest of the Suburbs: An Environmental History of Growing Food in Australian Cities* (Crawley: University of Western Australia Press, 2006); Clay McShane and Joel Tarr, *The Horse in the City: Living Machines in the Nineteenth Century* (Baltimore: Johns Hopkins University Press, 2007); Peter Atkins, ed., *Animal Cities: Beastly Urban Histories* (Farnham: Ashgate, 2012); Catherine McNeur, *Taming Manhattan: Environmental Battles in the Antebellum City* (Cambridge: Harvard University Press, 2014); Sean Kheraj, "Urban Environments and the Animal Nuisance: Domestic Livestock Regulation in Nineteenth-Century Canadian Cities," *Urban History Review/Revue d'histoire*

urbaine 44, nos. 1–2 (Fall/Spring 2015/2016): 37–55; Dean, Ingram, and Sethna, eds., *Animal Metropolis*; and Frederick L. Brown, *The City Is More Than Human: An Animal History of Seattle* (Seattle: University of Washington Press, 2017).

14. Brown, *The City Is More Than Human*, 244.
15. Richard White, "What Is Spatial History?" *The Spatial History Project* (February 2010), https://web.stanford.edu/group/spatialhistory/cgi-bin/site/pub.php?id=29. See also the arguments of Anne Kelly Knowles in "GIS and History," in *Placing History: How Maps, Spatial Data, and GIS are Changing Historical Scholarship*, ed. Anne Kelly Knowles (Redlands: ESRI Press, 2008), 2–25.
16. Jennifer Bonnell and Marcel Fortin, "Introduction," in *Historical GIS Research in Canada*, ed. Jennifer Bonnell and Marcel Fortin (Calgary: University of Calgary Press, 2014), xi.
17. Adonirum B. Judson, "Report on the Origin and Progress of the Epizoötic Among Horses in 1872, with a Table of Mortality in New York," in *Third Annual Report of the Board of Health of the Health Department of the City of New York*, April 11, 1872, to April 30, 1873 (New York: Appleton, 1873), 250; James Law, "Influenza in Horses," in *Report of the Commissioner of Agriculture for the Year 1872* (Washington, DC: Government Printing Office, 1874), 206; Andrew Smith, "Epizootic Influenza or Canadian 'Horse Distemper,'" in McClure, *Diseases of the Horse and Cattle and Sheep,* 86; "Disease Amongst Horses," *The Leader*, October 5, 1872, 4; "Horse Epidemic" *Globe*, October 5, 1872, 1.
18. *Census of Canada, 1870–71*, Vol. 3 (Ottawa: 1875), 106–7; "Horse Epidemic," *Globe*, October 5, 1872, 1; "Horse Epidemic," *The Mail*, October 7, 1872, 4; William Henry Irwin, ed., *Toronto City Directory for 1872–73* (Toronto: Telegraph Printing, 1872), 321; "Epidemic Among Horses," *Leader*, October 9, 1872, 2; "Horse Disease," *Perth Courier*, October 11, 1872, 2.
19. Using the ArcGIS Online Time Aware tool, the movement of the Great Epizootic can be observed in an interactive animated map at http://bit.ly/greatepizootic.
20. Some veterinary reports and other analysis offered precise dates for the first observed cases of the epizootic. Newspaper accounts typically reported the arrival of the disease one to two days after the first sick horses were found in city stables. Whenever possible, local reporting was used to pinpoint estimated first appearances of the disease in each city.
21. Newspaper research on this scale was based on extensive use of large digital newspaper archives, the most significant of which included the Library of Congress's "Chronicling America" project, GenealogyBank.com, and NewspaperArchive.com. Keyword searching combined with traditional combing of articles yielded hundreds of articles documenting the arrival and progress of the epizootic. Because of the limited digitization of Canadian newspapers, newspaper records for Canadian cities were also drawn from microfilm copies using traditional methods. For more on the digitization of historical Canadian newspapers, see Sean Kheraj, "Canada's Historical Newspaper Digitization Problem, Part 2," *Active History: History Matters*, February 13, 2014, http://activehistory.ca/2014/02/historical-newspaper-digitization-problem/.
22. US railroad data are current to 1870, based on layers created by "Railroads and the Making of Modern America: A Digital History Project," University of Nebraska, Lincoln, http://services.arcgis.com/ULBqC49IEeIR01GF/arcgis/rest/services/US_Railroads_1870/FeatureServer. Canadian railroad data are current to 1872, based on layers created by ESRI Canada, "Canadian Historic Railways," https://edumaps.esri.ca/ArcGIS/rest/services/WebGISLessons/Historic_Railways/MapServer.

23. Richard White, *Railroaded: The Transcontinental and the Making of Modern America* (New York: Norton, 2011), 50.
24. In 1860 the GTR at 800 miles was said to be the longest railroad under one management. Omer Lavallée, "The Grand Trunk Railway of Canada: An Overview," *Railroad History* no. 147 (Autumn 1982): 15.
25. *Halifax Citizen*, October 31, 1872, 2; "The Horse Disease," *Montreal Herald and Daily Commercial Gazette*, October 15, 1872, 2; Adoniram B. Judson, "History and Course of the Epizootic Among Horses upon the North American Continent in 1872–73," *American Public Health Association Reports* 1 (1873): 97; "The Horse Disease," *Quebec Daily Mercury*, October 31, 1872, 2.
26. White, *Railroaded*, xxix; for discussion of influence of railroads on perceptions of time and space, see, for example, Stephen Kern, *The Culture of Time and Space, 1880–1918* (Cambridge: Harvard University Press, 1983).
27. William Cronon examines how railroads imposed new geographies, or what he calls "Second Nature," on the American West in *Nature's Metropolis: Chicago and the Great West* (New York: Norton, 1991), 74.
28. "The Horse Disease at Buffalo," *The Mail*, October 22, 1872, 1; "The Horse Disease in Rochester," *The Mail*, October 22, 1872, 1; *Sterling Standard*, October 31, 1872, 2; Judson, "History and Course of the Epizootic Among Horses upon the North American Continent in 1872–73," 97–99; "Progress of the Disease in Other Cities," *New York Times*, October 27, 1872, 8; "The Horse Disease," *Dubuque Herald*, October 25, 1872, 1; "Look to Your Horses," *Chicago Tribune*, October 24, 1872, 8; "The Horse Disease," *Chicago Tribune*, October 25, 1872, 8.
29. Mark Fiege, *The Republic of Nature: An Environmental History of the United States* (Seattle: University of Washington Press, 2012), 265; White, *Railroaded*, 48–49.
30. "Equine Epidemic," *Detroit Free Press*, October 26, 1872, 1; "The Epizootic in Kalamazoo," *Kalamazoo Daily Telegraph*, November 10, 1872, 4; "Local Matters," *Kalamazoo Daily Telegraph*, November 12, 1872, 4; "Latest from Fort Garry," *Globe*, January 24, 1873, 1; "Progress of the Equine Epidemic," *Medical and Surgical Reporter*, June 7, 1873, 449; "The Epizootic," *Daily British Colonist*, September 7, 1873, 3; "Last Night's Dispatches," *Daily British Colonist*, September 13, 1873, 3; "The Epizootic," *New Westminster Mainland Guardian*, September 27, 1873, 3.
31. As Susan Jones notes, Law was influential on the development of veterinary medicine and education in the United States, founding the veterinary program at Cornell University. He was a leading voice for contagionist theories, and his program at Cornell was "the most widely emulated model of twentieth-century veterinary education." See Susan Jones, *Valuing Animals: Veterinarians and Their Patients in Modern America* (Baltimore: Johns Hopkins University Press, 2003), 29.
32. Erwin H Ackerknecht, "Anticontagionism between 1821 and 1867," *Bulletin of the History of Medicine* 22 (January 1948): 565–67; Ackerknecht argues that anticontagionism emerged in its most influential form in the first half of the nineteenth century and reached its highest peak of scientific respectability shortly before it was eclipsed by germ theory and other contagionist ideas. Michael Worboys, however, has contested the idea that there was a single germ theory of disease to emerge in the nineteenth century and instead shows that veterinarians, medical officers of health, doctors, and medical scientists circulated numerous germ theories. See Michael Worboys, *Spreading Germs: Disease Theories and Medical Practice in Britain, 1865–1900* (Cambridge: Cambridge University Press, 2000). For more on the role of miasma and smell in urban sanitary reform, see Joel Tarr, "Urban Pollution—Many Long Years Ago," *American Heritage* 22, no. 6 (October 1971): 65–106; Martin V. Melosi, *The Sanitary City*, 11–68; Melanie

Kiechle "Navigating by Nose: Fresh Air, Stench Nuisance, and the Urban Environment, 1840–1880," *Journal of Urban History* (published online before print March 18, 2015): 1–19. On the emergence of germ theory in the United States, see Nancy Tomes, *The Gospel of Germs: Men, Women, and the Microbe in American Life* (Cambridge: Harvard University Press, 1998), 23–87.

33. Linda Nash, *Inescapable Ecologies: A History of Environment, Disease, and Knowledge* (Berkeley: University of California Press, 2006), 52.
34. Law, "Influenza in Horses," 218, 234, 237–41.
35. Ibid., 235.
36. Judson, "History and Course of the Epizootic Among Horses upon the North American Continent in 1872–73," 106.
37. Ibid., 107.
38. McShane and Tarr, *The Horse in the* City, 14; Greene, *Horses at Work*, 166.
39. McShane and Tarr, *The Horse in the City*, 102–3.
40. "The Prevailing Epizootic amongst the Horses," *The Canada Farmer*, November 15, 1872, 400–1; "Epidemic Among Horses," *Leader*, October 9, 1872, 2; "The Horse Disease and the Cab-Drivers," *The Mail*, October 16, 1872, 4; "Horse Epidemic," *The Mail*, October 8, 1872, 6; "The Hounds," *The Mail*, October 7, 1872, 4; "A Ride with the Hounds," *Globe*, November 5, 1872, 2.
41. "Equine Epidemic," *Detroit Free Press*, October 26, 1872, 1.
42. "The Epizootic," *New York Herald*, October 23, 1872, 7.
43. "The Horse-Disease," *Chicago Tribune*, October 30, 1872, 5.
44. "The Horse Disease," *Chicago Tribune*, November 6, 1872, 5.
45. "Horse Epidemic," *Hamilton Spectator*, October 14, 1872, 3.
46. *Globe*, October 30, 1872, 2.
47. "The Equine Epidemic," *Detroit Free Press*, October 27, 1872, 1.
48. "The Horse Distemper," *New York Times*, October 26, 1872, 1.
49. "The Epizootic," *New York Herald*, October 23, 1872, 7.
50. "The Poor Beasts," *New York Herald*, October 24, 1872, 3.
51. "Epizootic," *San Francisco Chronicle*, April 17, 1873, 3.
52. "The Horse Disease," *San Francisco Chronicle*, April 18, 1873, 3.
53. "The Epizootic," *San Francisco Chronicle*, April 22, 1873, 1.
54. "The Horse Disease," *Montreal Herald and Daily Commercial Gazette*, October 15, 1872, 2; "City Passenger Railway Company," *Montreal Herald and Daily Commercial Gazette*, October 23, 1872, 1; "Montreal City Passenger Railway Company," *Montreal Herald and Daily Commercial Gazette*, October 16, 1872, 2.
55. "Equine Epidemic," *Detroit Free Press*, October 26, 1872, 1.
56. "The Epizootic," *San Francisco Chronicle*, April 22, 1873, 1.
57. "The Horse Epidemic," *Hamilton Spectator*, October 22, 1872, 2.
58. "Incidents of the Horse Plague," *Quebec Daily Mercury*, November 3, 1872, 2.
59. "The Equine Epidemic," *Detroit Free Press*, October 27, 1872, 1.
60. "The Poor Beasts," *New York Herald*, October 24, 1872, 3.
61. "The Sabbath of the Steeds," *New York Herald*, November 4, 1872, 9.
62. "The Horse Disease," *Chicago Tribune*, November 6, 1872, 5.
63. "Progress of the Disease in Other Cities," *New York Times*, October 27, 1872, 8.
64. "Oxen, Mules, and Streetcars," *Cleveland Plain Dealer*, November 6, 1872, 4.
65. "The Equine Influenza," *Memphis Daily Appeal*, November 27, 1872, 4.
66. Jones, *Valuing Animals*, 24.
67. McShane and Tarr, *The Horse in the City*, 103–7.
68. "The Horse Disease," *Boston Daily Advertiser*, October 31, 1872, 4.
69. "The Horse Disease," *New York Tribune*, October 26, 1872, 1.

70. "The Epidemic Among the Horses in Montreal," *Ottawa Free Press*, October 23, 1872, 1.
71. "The Epizootic," *Daily Phoenix* (Columbia, NC), October 30, 1872, 2.
72. "The Horse Epidemic," *Montreal Herald and Daily Commercial Gazette*, October 17, 1872, 2.
73. "Cliff House Stages," *San Francisco Chronicle*, April 21, 1873, 2.
74. "The Horse Disease," *Daily State Journal*, 1; "Advice Gratis," *Indianapolis Journal*, November 21, 1872, 4; on November 22, 1872, *The Evansville Courier* similarly advised its readers to "at once lay in a supply of fuel, as in case the horse disease becomes very bad here, it will be impossible to get coal or wood hauled, if a few days" (p. 2) and on November 23, 1872, the *Fort Wayne Daily Sentinel* noted a rise in the price of wood, but predicted that "In this wooden country fuel will not long enjoy mahogany prices" (p. 8); "The Money Side of the Horse Disease," *Burlington Free Press*, November 8, 1872, 2.
75. "A Visit to the Stables: The 'Epizoozy'—Is it Here or Is It Not?" *Savannah Morning News*, November 11, 1872, 3; "Savannah Equal to the Emergency: False Report Sent Abroad," *Savannah Morning News*, November 22, 1872, 3.
76. "How Many Horses Are There?" *Dubuque Herald*, November 30, 1872, 2.