## The Severe Winter of 1851-52 By Donald Sutherland

One of the more severe winters of the 19<sup>th</sup> century was the Winter of 1851-52. During this winter, there were several notable outbreaks of severe cold and frequent snows that commenced in October and continued into April. Extreme cold persisted to a memorable extent in the eastern United States. Even the Deep South was visited by both unseasonable cold and snow.

More than a month before the season's first snow whitened the ground, there were some hints that a hard winter might be approaching. Writing from Concord, Massachusetts, Henry David Thoreau captured a few noteworthy events that, when taken together, hinted at the first advances of a potentially severe winter<sup>1</sup>:

Sep  $14^{th}$ : A great change in the weather from sultry to cold. From one thin coat to a thick coat or two thin ones...

Monday Sep 15: Ice in the pail under the pump—& quite a frost...

Sep 23d: Notwithstanding the fog—the fences this morning are covered with so thick a frost that you can write your name anywhere with your nail...

Wednesday Oct  $\delta^{th}$ : ... The nights have been cool of late so that a fire has been comfortable...

October 25, 1851 likely marks as good a starting point as any for the actual onset of this remarkable winter. The October 27, 1851 edition of *The New York Daily Times* (now *The New York* Times) reported of the season's first lake effect snow in Buffalo, noting of October 25, "Snow is falling here, for the first time this season."<sup>2</sup>

Even as *The New York Daily Times* was informing its readers of the season's first lake effect snow that heralded the arrival of an unseasonably cold air mass. This cold air was drawn into a coastal storm, transforming it from an ordinary autumnal rainstorm into an extraordinary early-season winter storm. From this storm, snow was recorded from southeastern New York to New England.

Although accumulations were modest, the storm was noteworthy. "The eastern part of Long Island was visited with a snowstorm...which lasted several hours, making everything look quite winterish," *The New York Daily Times* reported.<sup>3</sup>

Boston received three inches of snow from the storm, with the newspaper reporting, "Yesterday morning, about 3 o'clock, a snow squall tried to conclude the Sunday's norther, but quite overdid the thing, by lengthening it into a real December snowstorm. The weather has condensed the quicksilver down to freezing point, and the snow, some three inches deep, has had a corresponding effect upon the wood and coal market..."<sup>4</sup> Thoreau recounted of October 27, "This morning I wake and find it snowing & the

ground covered with snow—quite unexpectedly—for last night it was rainy but not cold."<sup>5</sup> The snow covered the ground for several days afterward.<sup>6</sup>

This early arrival of accumulating snow was by far the earliest snow to affect the region in recent years. "At this present writing, the clear sparkling, starry heavens above, and the snow-clad earth beneath, gives us about as an emphatic idea of winter as one could reasonably wish, though it's rather forcing the season to open thus, on the 27<sup>th</sup> of October, in the midst of our Indian summer," the November 1 issue of the newspaper observed, "The first snow we had last year, was 6<sup>th</sup> of December, a small scud at that, and the first snow we had in 1849, fell on the 29<sup>th</sup> of December, but in 1848 we had a slight snow on the 9<sup>th</sup> of November, and 1847 it came along on the 19<sup>th</sup> of December. So 1851, in my 'notings' of weather, these five years, shows this October to be 'up head,' in snowstorms."<sup>7</sup>

Before the first week of November had passed, Philadelphia saw some snowfall. "Slight snow squalls have prevailed all day, the air is quite raw, and the wind strong," *The New York Daily Times* reported of November 4.<sup>8</sup>

On November 10, the weather in Albany was "very disagreeable" and "snowing quite fast."<sup>9</sup> A "considerable quantity" of lake effect snow was also reported near Lake Erie.<sup>10</sup> New England also shared in the snow with Thoreau writing, "This morning the ground is once more whitened with snow…"<sup>11</sup>

Northern New England likely received a significant snowfall. On November 13, Thoreau wrote, "The cattle train came down last night from Vermont with snow nearly a foot thick upon it."<sup>12</sup>

On November 13, additional snow coated Long Island. "Yesterday morning quite a snowstorm visited the little 'State of Long Island.' Suffolk and Queen's Counties had the most of it, enough to make every thing look winterish" *The New York Daily Times* observed.<sup>13</sup> The storm likely passed well to the south of New England, bringing little more than clouds to the region. Thoreau described November 3 as having "A cold & dark afternoon the sun being behind clouds in the west..."<sup>14</sup>

By November 14, some ponds were beginning to freeze over in New England. "Unexpectedly find Heywoods Pond frozen over thinly it being shallow & coldly placed," Thoreau observed.<sup>15</sup>

November 17 saw lake effect snow mixed with rain off Lake Erie.<sup>16</sup>

On November 21, a vicious coastal storm ravaged the Northeast with heavy rain, high winds, and coastal flooding. "The storm…on the Sound [Long Island Sound] was very severe. The wind blew a hurricane, the rain fell in torrents, and the sea ran high," *The New York Daily Times* reported.<sup>17</sup>

The newspaper continued:

At New Haven, the tide rose to a height greater than has been known for ten years past. The lower part of the city was inundated, and great damage was done...

At Worcester, snow had fallen to the depth of three inches, but it was washed away by the rain.

In Portland, ME., the storm was felt with great severity. The tide in the morning rose to within three inches of the height of the great tide of last Spring, and flooded most of the wharves. In the interior snow fell instead of rain, and above Paris, there was snow on the ground sufficient to make good sleighing.<sup>18</sup>

On November 22, high winds around the back side of an intense nor'easter brought the season's heaviest lake effect snow to date to parts of New York State. Oswego, in particular, was hard hit. *The New York Daily Times* reported, "It is now blowing a perfect hurricane from the west, accompanied by a heavy snow-storm—by far the heaviest storm of the season. It will be a hard night on the lake [Lake Ontario]..."<sup>19</sup>

Even at this time, there was growing awareness among some observers that a severe winter was beginning to settle in. The November 24 issue of *The New York Daily Times* revealed, "A correspondent of *The Boston Traveller*, writing from Dartmouth College, says that the weather for the last ten days has been unprecedented for severity and early setting in of winter. The Connecticut [Connecticut River], in still places, as above Norwich Bridge, is frozen over from shore to shore."<sup>20</sup>

On November 25, two inches of snow fell at Utica<sup>21</sup> as a strong storm affected New England. Other parts of New York State received even more snow. Ithaca saw a "heavy fall of snow," and Binghamton received in excess of 8".<sup>22</sup> Boston reported a "heavy storm" that delayed both steamboat trains from New York and the mail<sup>23</sup> and Thoreau reported, "This morning the ground is again covered with snow deeper than before."<sup>24</sup>

Winter also came on with a flourish in the Upper Midwest. *The New York Daily Times* disclosed, "The winter came on suddenly in the Lake Superior region, without the usual Indian Summer. As early as December 1, the fall of snow was equal to three feet in depth."<sup>25</sup>

By early December, the Erie Canal was beginning to freeze up near Buffalo and frozen at other places. *The New York Daily Times* reported the following for December 2, 1851<sup>26</sup>:

*Buffalo:* "There is a thin coat of ice on the Canal here, and the boats are forcing their way through."

*Rochester:* "...the Canal was frozen over, this morning; at noon it was full of floating ice. Many boats are laid up."

*Syracuse:* "The Canal is full of floating ice...unless we have a thaw, twenty-four hours more will completely stop the boats. It is freezing fast now."

As the cold was growing more intense, Philadelphia received "quite a snowstorm" on December 4.<sup>27</sup> There was blowing and drifting as the snow was powdery due to the cold temperatures.<sup>28</sup>

The eastern U.S. was not the only part of the nation witnessing an expanding snowcover. Those delivering the mail from Santa Fe "encountered a snowstorm at Cedar Springs" and the "snow was two feet deep on the Plains to Fort Atkinson."<sup>29</sup>

December 7 brought snow that changed to rain during the evening to Boston.<sup>30</sup> By this time, lakes and ponds had become sufficiently frozen to allow for skating. In his December 14 journal entry, Thoreau observed, "The boys have been skating for a week..."<sup>31</sup>

On December 12, additional snow fell over parts of New England, helping lay the groundwork for a significant Arctic invasion. "The night is very dark and snow is falling rapidly," came the report from Boston.<sup>32</sup>

A prolonged siege of unusual cold had already frozen much of the Ohio Valley's waterways. Reports from select cities included<sup>33</sup>:

*Cleveland:* "We have cold weather, but no snow. The river is freezing over, and unless it gets warmer, in twenty-four hours, navigation will be suspended."

*Sandusky, Ohio:* "The weather is very cold—our bay is frozen over, and navigation is suspended."

The cold was heading east. The December 14-15 period saw a series of Arctic cold fronts move across New York State. Ahead of the front, snow fell heavily at times. Behind the front, intense lake effect snows blanketed parts of western New York State. For December 15, *The New York Daily Times* reported, "It snowed most of the morning. The sleighing is fine and the weather mild and pleasant"<sup>34</sup> in Rochester. In Albany, it was reported, "A snowstorm has been prevailing since 8 o'clock last evening. It is now snowing hard. The wind is southeast and the thermometer at 36."<sup>35</sup> Meanwhile from Buffalo, the report was, "The wind is west and cold... We have good sleighing."<sup>36</sup> The Boston area received more than six inches of snow.<sup>37</sup>

By December 16, a frigid air mass covered much of the Ohio Valley and Northeastern United States. Select reports for the date from *The New York Daily Times* included<sup>38</sup>:

*Buffalo:* "A violent snowstorm commenced here last night and continued up to this morning, the wind blowing a perfect gale. The snow is between eighteen inches and two feet deep. The thermometer is 10 to 11 above zero."

*Cleveland:* "Thermometer 5 degrees below zero--the coldest at this place for five years past."

Detroit: "Thermometer at zero."

*Rochester:* "At sunset, the thermometer here stood 2 degrees below zero; air clear and calm--good sleighing."

Extreme cold remained in place for several days. Select reports from December 18 included<sup>39</sup>:

*Baltimore:* "This is the coldest day we have experienced for many years; the ice is 8 inches thick."

*Boston:* "For a day or two past the weather has been quite cold. The Charles River is frozen over, and the mercury at 1 pm today, stood at only 10 degrees above zero."

Cincinnati: "The weather continues intensely cold."

*Louisville:* "The weather here is intensely cold. Navigation is closed above and below the Falls. The Ohio is frozen over for the first time in ten years."

New Orleans: "The weather here is extremely cold. Thermometer 36 above zero."

*Springfield, Massachusetts:* "The weather here is excessively cold... [T]he mercury in the thermometer...this morning stands at 9 degrees below zero."

Toronto: "Thermometer 18 below zero; yesterday it was only 6 below."

On December 17, Thoreau described a "piercing cold afternoon."<sup>40</sup> He also wrote of the Concord area's being covered by snow observing, "The pitch pines hold the snow well... The winter morning is the time to see the woods & shrubs in their perfection wearing their snowy & frosty dress... The trees wear their snowy burden but coarsely after mid day..."<sup>41</sup>

The Arctic air mass gave way to somewhat milder readings about a week after its onset with temperatures rebounding into the 20s and 30s across much of New York State.<sup>42</sup> Nevertheless, in New England, temperatures remained cold enough for snow. On December 20, Thoreau observed, "Snow squawls pass obscuring the sun—as if blown off from a large storm."<sup>43</sup> He also wrote that the blanket of snow covering the ground was growing thicker. "Most walkers are pretty effectually shut up by the snow," he stated.<sup>44</sup>

Another brief but sharp shot of bitter cold air began pushing into the region on Christmas Eve with "spits" of snow<sup>45</sup>. Christmas Day saw a biting wind. "A wind is now blowing the light snow which fell...into drifts... On high hills exposed to wind & sun it curls off like the steam from a damp roof in the morning."<sup>46</sup>

Select temperatures for December 26 included<sup>47</sup>:

Buffalo: 9 [8 pm] Syracuse: 0 [8 pm] Troy: -5 [6 am]

New England bore the brunt of this cold and the frigid readings made headlines. The December 26, 1851 news account from Boston read: "It was tremendously cold here this morning, the thermometer being at 7 o'clock eight degrees below zero. At the same time, it was ten below in Summerville, and twelve in Watertown."<sup>48</sup>

As December came to a close, much warmer air overspread the region. On December 28, Thoreau recorded, "All day a drizzling rain—ever & anon holding up with driving mists— A January thaw— The snow rapidly dissolving, in all hollows a pond forming— unfathomable water beneath the snow."<sup>49</sup> A day later, Thoreau recounted, "The ground is almost bare...it is warm as an April morning... It is exciting behold the smooth glassy surface of water where the melted snow has formed large puddles & ponds—and to see it running in the sluices...<sup>50</sup> An unseasonably warm afternoon ensued with Thoreau writing, "It feels as warm as in summer...<sup>51</sup>

December 31 was the "3d warm day" in Thoreau's words and drizzle commenced.<sup>52</sup> Rain fell in such cities as Albany, Buffalo, and Rochester.

Select news accounts for December 31 included<sup>53</sup>:

*Albany:* "It has been raining here hard all day. The water in the river is very high and still rising rapidly. All communication with the opposite side is discontinued on account of the uncertain state of the ice."

Buffalo: "It has been a cloudy and unpleasant day. It now rains a little. Thermometer 40."

*Rochester:* "The mild weather still continues. Some rain fell today. Thermometer 42; wind southerly."

*Utica:* "We have had a dark and cloudy day, with warm rain. Thermometer 47 wind southwest."

The first week in January saw somewhat cooler readings take over, highlighted by a prolonged "severe storm of snow, hail and rain" on January 3-4, 1852.<sup>54</sup>

By January 5, readings were mainly in the upper 20s and lower 30s across New York State. Some snow had fallen across the region a day earlier with Albany reporting 3".<sup>55</sup>

A significant snowstorm then hit New England on January 7. The storm saw heavy snow that "drifted badly" in Boston and led to the railroads being "completely blocked up."<sup>56</sup>

The second week of January began with a return of benign conditions though morning readings were again quite cold in eastern New York State. News accounts for January 8 included<sup>57</sup>:

*Albany:* The weather is very cold. The ferry boat has discontinued running on account of the intense cold. The sleighing is excellent... Thermometer 6 [7 am]

Buffalo: Thermometer 22 [8 am]... It is cloudy, but very pleasant day."

Rochester: "It is a glorious morning."

Troy: "Thermometer at 6 am, two below zero."

Milder breezes remained the rule in New England. On January 10, it "rained heavily" in Boston and mild readings were reported across much of New York State.<sup>58</sup>

The respite from the severe cold was shattered later in the week. This time, as the Arctic renewed its assault on the eastern United States, notable cold expanded into the Deep South in addition to the Mid-Atlantic and Northeast.

On January 13, 1852, a snowstorm moved across the Deep South. The report from Charleston, South Carolina was "It has been snowing here all day."<sup>59</sup> In New Orleans, *The New York Daily Times* reported, "For the first time in twenty years we have had an old fashioned New England snowstorm. The weather is very cold, and there are six inches of snow on the ground."<sup>60</sup> In the wake of the storm, the weather continued "severely cold" in the Deep South and it was observed in New Orleans that "from present appearances the snow will continue upon the ground for some days."<sup>61</sup>

As the Deep South was being punished by a snowstorm, a fierce lake effect snowstorm was ongoing in western New York State. "We are in the midst of the most violent snowstorm ever known here," the January 14, 1852 issue of *The New York Daily Times* reported of Buffalo, "The snow is drifting in huge hills, and the air is quite blinding. It covers windows, doors, and the sides of houses, till whole blocks look like masses of snow. The storm has raged nearly twenty-four hours, and is still unabated."<sup>62</sup>

Bitter air was in control throughout the East. On January 14, the report from Washington, DC was "The thermometer in this city is only 5 degrees above zero. The Potomac is closed."<sup>63</sup>

Following the huge lake effect storm, the snow between Dunkirk and Dayton was reported to be 5 to 7 feet deep but milder air had returned to parts of the affected area on January 15.<sup>64</sup> Northern New England was an exception as extreme cold continued.<sup>65</sup>

By mid-month, an ice bridge had been constructed at Havre de Grace, Maryland and the ice bridge held until February 24.<sup>66</sup>

In Weatherwise, weather historian David Ludlum detailed this project. He wrote:

A ferry usually linked the rails on either side of a wide water obstacle, so the ice of a severe winter could stop travel completely.

The most spectacular example of this made national headlines in January-February 1852, when traffic across the Susquehanna River between Havre de Grace and Perryville, Maryland, was "interdicted" for eight weeks. The river there is about eight-tenths of a mile wide. The Philadelphia, Wilmington, and Baltimore Railroad (P. W. & B. R. R.) employed a ferry across a stretch of shoal water where ice masses from upriver often grounded and piled up. Gorges formed as the cakes upended and then froze into solid, fantastic masses resembling an Arctic landscape...

The annual report of the P. W. & B. R. R. [Philadelphia, Wilmington, and Baltimore Railroad], issued on January 7, took notice of the difficulty in getting the mail through, sometimes with delays up to 48 hours.

Facing a loss of revenues, the railroad responded with speed and ingenuity. The ice was extremely firm; in places the heaped-up cakes were 12 feet thick. At first, a boardwalk was laid across the ice for passengers to cross on foot to a connecting train. The mail was hauled on sleighs.

This solution, however, did not satisfy Isaac R. Trimble, a former Army engineer and now chief engineer of the railroad. He was determined to build an ice bridge with iron rails. A right-of-way was cleared on the ice: some of the worst pile-ups were avoided by curves, while hummocks were chopped level, and depressions filled in with cracked ice. Condemned ties were then laid and U-shaped rails fastened to them with spikes.

Since the ice level was 10 to 15 feet below the level of the permanent tracks on either bank, inclined wooden trestles were constructed from the shoreline. One at a time, baggage and freight cars rolled down the trestle. Once upon the ice the cars were pulled across the river by horse-drawn sleighs carrying the passengers alongside the tracks.

At the opposite bank, a waiting locomotive hauled the cars up the trestle. The railroad reported as many as 40 cars were moved across in a single day. In all, 1,378 cars and over 10,000 tons of mail and merchandise were hauled across the ice.

Completed on January 15, the ice bridge served every day until a general thaw on February 24, when the rails were quickly removed. The ice started breaking up the next day. The ferry did not make its first commercial trip until March 3, eight weeks after its last crossing.<sup>67</sup>

The somewhat milder air was swept away by a renewed Arctic onslaught. By January 18, much of the region was in the midst of a snowstorm that affected the Mid-Atlantic and Northeastern U.S. from January 17-19. Temperatures were also very low.

Select reports for the January 18 included<sup>68</sup>:

*Albany:* "Several inches of snow have fallen during the day. Wind northwest; thermometer 8."

*Boston:* "Snow has fallen here nearly all day, and it is still falling fast (10 o'clock PM). The weather is extremely cold."

*Rochester:* "The weather has been very cold here today—thermometer 2 degrees below zero. It has been snowing and blowing hard all day."

*Syracuse:* "We have had a cold and cloudy day, with the wind northwest; thermometer zero."

On January 19, the news account from Albany read, "The railroad trains from the West, South and East have all failed today, owing to the heavy fall of snow, which has blocked up all the roads leading out of this city."<sup>69</sup>

The January 20, 1852 edition of *The New York Daily Times* reported that New York City had received a significant snowfall from that storm. "More than a 'nine days wonder' with our citizens will be the great storm which commenced on Saturday evening and continuing through Sunday, broke away on Monday morning, leaving the earth with a covering of snow full eight inches deep."<sup>70</sup>

The icing of the City's waterways also made the news. "The East River is very much blocked up with ice at the present time, causing considerable vexatious delay to passengers who have to cross the Ferries on business. At one time yesterday, on the Brooklyn side of Fulton Ferry, the ice became so much packed in the Slip that it was impossible for the boats to reach the wharf as usual, and passengers were landed by means of a gangway made of plank," *The New York Daily Times* reported.<sup>71</sup>

At the same, extremely cold air covered such states as Minnesota. On January 18, a "perfect gale" was accompanied by very low temperatures.<sup>72</sup> On January 19, the temperature fell to -32 at Fort Snelling, Minnesota and -34 at St. Paul.<sup>73</sup>

The severe cold peaked in the eastern United States on January 20 with widespread subzero readings that extended into the big cities of the Mid-Atlantic and Northeast.

According to various editions of *The New York Daily Times*, select accounts of this icy day included:

*Baltimore:* "The weather last night was colder than ever known here. Thermometer 5 degrees below zero. The harbor is closed with the ice."<sup>74</sup>

*Massachusetts:* "The thermometer at Lowell this morning was 20 degrees below zero, and at Salem 14 below."<sup>75</sup>

*New Haven:* -4 degrees.<sup>76</sup>

*New Orleans:* "The weather is the coldest ever known here—the thermometer this morning marked only 19 above zero."<sup>77</sup> The mercury finally bottomed out at 15 degrees.<sup>78</sup> That temperature would stand as the all-time low reading for New Orleans until February 1899.<sup>79</sup>

*New York City:* "At daylight...the thermometer stood at four degrees below zero--a point it has not reached before in many years--and in consequence, our rivers are choked up with ice and our ferry boats have great difficulty in making their way through it."<sup>80</sup>

So remarkable was the cold in the Deep South that the *Savannah Republican* opined, "If the oldest inhabitant has ever seen anything like it before, he should make it known at once, or forever hereafter hold his peace."<sup>81</sup>

Philadelphia: The severely cold weather still continues unabated. At sunrise this morning, the thermometer stood at 7 degrees below zero. The Delaware is tight at this city, and hundreds of persons are crossing today on the ice, to and from New Jersey. Our railroads are still much obstructed by snow."<sup>82</sup>

Pittsburgh: "Thermometer here 15 degrees below zero."<sup>83</sup>

*Ebensburg, Pennsylvania:* "Early this morning the thermometer stood at 22 degrees below zero."<sup>84</sup>

Iced waterways were commonplace all along the Eastern Seaboard from Norfolk, Virginia to Boston. Some reports of the icing included<sup>85</sup>:

*Baltimore:* "Baltimore Bay is still closed with ice as far down as the Rappahannock River. Weather severely cold and Thermometer falling... The ice in the Rappahannock in some places is piled 10 to 20 feet high."

*Boston:* "All communication with Nantucket has been cut off effectually by the ice, ever since Wednesday last [January 14, 1852]."

*Norfolk:* The harbor is completely frozen up, and the boat for Baltimore and Richmond are unable to proceed on account of the ice."

*Philadelphia:* "The Bay is blockaded up with ice, some parts closed, and people are passing from the Eastern and Western shore. The ice in the river is a foot thick, and navigation suspended.

On January 22, the report from the steamer *Florida* in the Gulf of Mexico was, "The weather is still cold—water too low to make Grant's Pass [in southwestern Alabama], so we go round into the Gulf. Our Steamer is covered with ice; wherever the water strikes, it quickly freezes. One would think he was in the Bay of New York. The seasons have strangely changed. Wonder if the North Pole has been jostled by the expeditions in those regions in search of Sir John Franklin [an explorer who set out from England on May 19, 1845 in search of the Northwest Passage and never returned]."<sup>86</sup>

The weather had been unusually cold for so long in Deep South that *The New York Daily Times* reported in a correspondence filed February 5, "There have been days as cold, but the 'Oldest Inhabitant' never has seen weeks of such severe cold weather in this so southern a clime; the bay has been partially frozen over and skates have been in demand—the like was never heard of before in Mobile."<sup>87</sup>

Toward the end of the month, the temperatures moderated for a time<sup>88</sup> as milder readings spread eastward out of the Plains States.<sup>89</sup>

January 31-February 1, 1852 saw a "violent" snowstorm<sup>90</sup> bring 6" to Boston and 8"-10" at Portland.<sup>91</sup> This snowstorm was noteworthy for its "very severe" winds.<sup>92</sup>

After this snowstorm, the severe Winter of 1851-52 eased its grip just a little. February saw no additional headline-making storms or outbreaks of cold. In fact, on February 5 the mercury reached 55 degrees at Fort Snelling and on February 9, an even milder 57.<sup>93</sup> Morning temperatures on February 6 and 10 were only 36 and 38 respectively.<sup>94</sup> As a result of this unseasonable warmth, a St. Paul newspaper described the early February weather as "being as mild as April…"<sup>95</sup>

On February 12, the Hudson River was again flowing at Troy, New York even as it remained frozen at Albany.<sup>96</sup>

But winter was far from defeated and in late February, the North Central U.S. was again experiencing snow and very cold readings<sup>97</sup> as a sign of things to come farther east.

Needless to say, in the Northeast, readings remained cool, though not severely cold for February as a whole. By early February 28, some snow had again visited New England.<sup>98</sup>

In response, a correspondent to *The New York Daily Times* wrote the following from Boston on February 29:

March promises to come in like a lion. Beranger [French writer Pierre Jean Beranger] says: 'Maudit printemps reviendra tu toujours?' If he were now in Boston he would be apt to say: 'Maudit hiver reviendra tu toujours?' For, I am beginning to think this Winter will never go away. A few days ago we had many appearances of Spring—thaw, sunshine, bland airs, and a budding of our ideas in general; but yesterday morning there was again the horrible old story of the last three months—snow in the night, snow with a

# high wind in the morning, a drenching rain towards evening, and last night, a perfect hurricane, howling indescribably from the western points of the compass.<sup>99</sup>

In March, the lion of Winter 1851-52 awoke with renewed vigor bringing a snowstorm to the Mid-Atlantic region on March 2-4. On March 2, it was reported that a "heavy storm is prevailing in the Chesapeake."<sup>100</sup> For March 4, *The New York Daily Times* reported, "Snow has fallen here [Philadelphia] to a considerable depth this evening, also at Pottsville and Reading."<sup>101</sup>

March 8-9 saw milder weather and rain move into the Buffalo area, with the weather highlight being a "violent thunderstorm."<sup>102</sup>

March 17, saw another snowstorm affect the Mid-Atlantic and parts of New England. *The New York Daily Times* reported of the weather in Philadelphia, "We have had a furious snowstorm here all day."<sup>103</sup> In New York City, *The New York Daily Times* observed, "We had a return of winter... About 10 o'clock in the morning, snow began to fall, and from that time until midnight it continued to come down. The wind was blowing strongly from the northwest, driving the snow into every nook and corner, rendering it almost impossible to remain in the streets."<sup>104</sup>

On March 22-23, Buffalo, New York received an 11" snowfall.<sup>105</sup>

A "regular snow storm" affected central New York State on March 31 while clearing and cool weather moved into the Mid-Atlantic region in the wake of the storm there.<sup>106</sup> The arrival of this cool air set the stage for another winter storm for what was becoming a winter-weary region<sup>107</sup>.

April 4-6, 1852 saw a major winter storm blanket parts of the Mid-Atlantic and Northeast. In Baltimore, "The tide rose to an unusual height causing the water to overflow the wharves in several places, filling cellars and sweeping away much property... Such weather, at the present season of the year, has not been experienced for 30 years past."<sup>108</sup> In Philadelphia, 4" accumulated.<sup>109</sup> New York City suffered from "snow, hail, rain, driving sleet, and cold, bleak winds."<sup>110</sup> In Boston, "Nearly a foot of snow fell on a level, while in some places the drifts are three and four feet deep."<sup>111</sup>

Across eastern New England, the storm had been particularly severe. "From various points east of this city [Boston], we hear that the gale raged with great violence, accompanied with snow... At New Bedford, Taunton, Fall River and Newburyport, the snow is eight inches deep."<sup>112</sup> Four inches fell in Portland, Maine and Hartford received "several inches."<sup>113</sup>

Over the Atlantic Ocean and Long Island Sound, the winds were especially ferocious. "The steamer St. Lawrence, which left Portland on Monday evening [April 5], had a very stormy and dangerous passage... About 12 o'clock Monday night, when about half-way between Thacher's Island and the Isle of Shoals, she encountered a tremendous snowstorm, the wind blowing a hurricane, and the sea running very high. The weather was so thick that she could not make a harbor...," *The New York Daily Times* reported.<sup>114</sup> "On the Sound [Long Island Sound], the storm raged with almost unknown fury," the newspaper added.<sup>115</sup>

Although the recent winters preceding Winter 1851-52 had also seen snowfall in April, this was the largest such storm. *The New York Daily Times* noted, "Remarkable storms, for three or four years past, have occurred in April, but for inappropriateness to the season this surpasses them all."<sup>116</sup>



Group of people on a large sleigh, drawn by six horses; appeared in the April 10, 1852 edition of the *Illustrated London News* on page 284 (Library of Congress)

On April 12-13, a heavy snowstorm buried parts of western Massachusetts under two feet of snow.<sup>117</sup> Heavy rain also changed to accumulating snow in coastal New England with Providence picking up 7".<sup>118</sup>

Almost as if Winter 1851-52 had grown increasingly furious at the prospect of the approach of its inevitable end, the April 15<sup>119</sup>-22 period saw one or two storms in close succession lash the Northeast with high winds and heavy precipitation. Significant tidal flooding was reported.

On April 19, it was reported from Boston that a "northeast storm continues to rage with great severity... The storm has now continued for 36 hours, and is more violent this evening."<sup>120</sup>

The New York Daily Times reported the following for New York City:

The violent rainstorm and heavy gale of wind that visited this vicinity...has no doubt caused considerable damage to buildings and other property in various parts in the city...

The flood tide rose to such a height as to overflow many of the piers along the East and North Rivers, and also inundating the cellars in West, Washington, Greenwich, Morris, Rector and other streets on the west side of the city...

The signs and awnings along the Bowery, Broadway, Chatham, Canal, Grand, and Greenwich Streets, suffered considerable. In some places the wrought iron awning posts were bent double, and some of the cast iron ones broken, as easily as if they had been made of wood.<sup>121</sup>

In Brooklyn, "awnings, signs, umbrellas, chimney-tops, trees, house-roofs, and even houses, were scattered like feathers in every direction."<sup>122</sup>

Massachusetts experienced serious flooding. In Lowell, "The great storm which we have had for the last four or five days, has raised the Merrimac to a height before unknown to the 'oldest inhabitant.'... The mills are stopped and the lower rooms thereof are covered with water, ten or twelve inches in depth."<sup>123</sup>

Even Pittsburgh saw flooding as "the waters of the Monongahola and Allegheny commenced rising at Brownsville" and "the pier-marks of Monongahola Bridge were covered—the river having risen thirty feet and still rising at the rate of seven inches an hour."<sup>124</sup>

Other reports included<sup>125</sup>:

Boston: "The storm Eastward of us is reported to be very severe."

Harrisburg: "The Susquehanna is still very much swollen, and much damage is feared."

Norfolk: "The storm at Norfolk and on the coast has been very severe."

*Washington, DC:* "A destructive freshet [flood] occurred today in the Potomac River, destroying an immense amount of property near the wharves in Georgetown and along the line of the Canal... It is the greatest flood ever known here, exceeding that of 1847... At noon today [April 20], the long bridge, which unites this city with the Virginia shore, floated down the Potomac."

On April 23, additional snow fell across parts of New York State. "We learn that it is snowing at Albion this morning," was the news report from Utica.<sup>126</sup>

Although winter finally broke in the eastern United States, it would take two additional months for winter to fully break in the North Central U.S. On April 25, a heavy snowstorm buried parts of this region.<sup>127</sup>

May 16-20 saw unseasonably cold mornings at Fort Snelling, Minnesota with readings in the 30s and on May 18-19, frost wiped out early vegetation.<sup>128</sup>

June 9 and 24 saw sunrise temperatures of 34 degrees and 38 degrees respectively at Fort Snelling, Minnesota.<sup>129</sup>

Afterward, the long, hard Winter of 1851-52 was finished. It would remain embedded in memories with its start immortalized by Henry David Thoreau.

#### APPENDIX

# Winter 1851-52's Cold vs. Modern Daily Record Temperatures<sup>130</sup>:

*December 26, 1851:* Boston: -8; Modern record: -4, 1980

*January 19, 1852:* St. Paul: -34; Modern record for Minneapolis-St. Paul: -34, 1970 (all-time record low temperature)

January 20, 1852: Baltimore: -5; Modern record: -3, 1985 Boston: -14 in nearby Salem; Modern record for Boston: -3, 1946 Lowell: -20; Modern record for nearby Nashua, NH: -19, 1971 New Orleans: 15; Modern record: 15, 1985 New York City: -4; Modern record: 0, 1994 Philadelphia: -7; Modern record: -3, 1984 Pittsburgh: -15; Modern record: -18, 1985

## Monthly Mean Temperatures and Extremes for New Haven<sup>131</sup>:

December 1851: 24.9; Highest: 51; Lowest: -5 January 1852: 23.6; Highest: 51; Lowest: -4 February 1852: 29.0; Highest: 50; Lowest: 2 March 1852: 35.5; Highest: 57; Lowest 10

December 1851-February 1852 Mean Temperature: 25.8 (exceeded only by 1783-84, 1790-91, 1814-15, 1816-17, 1817-18, 1831-32, 1834-35, 1835-36, 1836-37, and 1855-56 during the 1780-81 through 1864-65 period).

### Monthly Mean Temperatures and Precipitation for New York City<sup>132</sup>:

42.2	5.65"
27.4	2.70"
24.3	1.06"
30.7	2.58"
36.7	3.40"
43.7	3.93"
	27.4 24.3 30.7 36.7

Temperatures are from Fort Columbus Marine hospital on Governors Island and precipitation records are from Jamaica, New York.

# North Atlantic Oscillation (NAO)<sup>133</sup>:

September 1851: -0.57 October 1851: +1.16 November 1851: -1.49 December 1851: -0.72 January 1852: +2.08 February 1852: +0.66 March 1852: -2.60 April 1852: -2.56 May 1852: +0.89 June 1852: +2.14

## Pacific-North America Pattern (PNA):

The PNA was likely predominantly positive. Historical accounts reveal that Winter 1851-52 in Seattle "was mercifully mild."<sup>134</sup>

#### ENDNOTES

<sup>5</sup> Henry David Thoreau, A Year in Thoreau's Journal: 1851, New York: Penguin Books, 1993, p.274.

<sup>9</sup> "Snow Storm at Albany," The New York Daily Times, November 11, 1851.

- <sup>11</sup> Henry David Thoreau, A Year in Thoreau's Journal: 1851, New York: Penguin Books, 1993, p.286.
- <sup>12</sup> Henry David Thoreau, A Year in Thoreau's Journal: 1851, New York: Penguin Books, 1993, p.294.

- <sup>14</sup> Henry David Thoreau, A Year in Thoreau's Journal: 1851, New York: Penguin Books, 1993, p.293.
- <sup>15</sup> Henry David Thoreau, A Year in Thoreau's Journal: 1851, New York: Penguin Books, 1993, p.294.
- <sup>16</sup> "Snow Storm on Lake Erie," The New York Daily Times, November 18, 1851.

- <sup>18</sup> "The Late Gale—Damage to Shipping, &c.," The New York Daily Times, November 24, 1851.
- <sup>19</sup> "Gale and Snow-Storm at Oswego," The New York Daily Times, November 24, 1851.

<sup>&</sup>lt;sup>1</sup> Henry David Thoreau, A Year in Thoreau's Journal: 1851, New York: Penguin Books, 1993, pp.225-258.

<sup>&</sup>lt;sup>2</sup> "Further Disasters on Lake Erie—Wrecks and Loss of Life—Snow Storm at Buffalo, &c.," *The New York Daily Times*, October 27, 1851.

<sup>&</sup>lt;sup>3</sup> "Snow," The New York Daily Times, October 29, 1851.

<sup>&</sup>lt;sup>4</sup> "Boston," The New York Daily Times, November 1, 1851.

<sup>&</sup>lt;sup>6</sup> "Massachusetts," *The New York Daily Times*, November 4, 1851.

<sup>&</sup>lt;sup>7</sup> "Boston," The New York Daily Times, November 1, 1851.

<sup>&</sup>lt;sup>8</sup> "Philadelphia," The New York Daily Times, November 5, 1851.

<sup>&</sup>lt;sup>10</sup> "The Weather on Lake Erie," The New York Daily Times, November 12, 1851.

<sup>&</sup>lt;sup>13</sup> "Snow Storm," The New York Daily Times, November 14, 1851.

<sup>&</sup>lt;sup>17</sup> "The Late Gale—Damage to Shipping, &c.," The New York Daily Times, November 24, 1851.

<sup>&</sup>lt;sup>20</sup> "The Late Gale—Damage to Shipping, &c.," The New York Daily Times, November 24, 1851.

<sup>&</sup>lt;sup>21</sup> "Snow at Utica," The New York Daily Times, November 26, 1851.

<sup>&</sup>lt;sup>22</sup> "The Snow Storm, &c.," The New York Daily Times, November 27, 1851.

<sup>&</sup>lt;sup>23</sup> "Heavy Snow Storm at the East—Detention of the Mails for the Cambria," *The New York Daily Times*, November 27, 1851.

<sup>&</sup>lt;sup>24</sup> Henry David Thoreau, A Year in Thoreau's Journal: 1851, New York: Penguin Books, 1993, p.304.

<sup>25</sup> "Lake Superior," The New York Daily Times, January 20, 1852.

<sup>26</sup> "The Weather and the Erie Canal," *The New York Daily Times*, December 3, 1851.

<sup>27</sup> "Philadelphia," The New York Daily Times, December 5, 1851.

<sup>28</sup> "Being very dry and fine it does not lie upon the ground. The weather is very cold," in "Philadelphia," *The New York Daily Times*, December 5, 1851.

<sup>29</sup> "Letter from Santa Fe.—Great Snow Storm," *The New York Daily Times*, December 6, 1851.

<sup>30</sup> "Snowstorm at the East," The New York Daily Times, December 8, 1851.

<sup>31</sup> Henry David Thoreau, A Year in Thoreau's Journal: 1851, New York: Penguin Books, 1993, p.308.

<sup>32</sup> "Non-Arrival of the Niagara at Boston," The New York Daily Times, December 13, 1851.

<sup>33</sup> "The Weather and Navigation," The New York Daily Times, December 15, 1851.

<sup>34</sup> "The Weather, &c.," The New York Daily Times, December 16, 1851.

<sup>35</sup> "The Weather, &c.," The New York Daily Times, December 16, 1851.

<sup>36</sup> "The Weather, &c.," The New York Daily Times, December 16, 1851.

<sup>37</sup> Henry David Thoreau, A Year in Thoreau's Journal: 1851, New York: Penguin Books, 1993, p.312.

<sup>38</sup> "Reports of the Weather Yesterday," The New York Daily Times, December 17, 1851.

<sup>39</sup> "Reports of the Weather Yesterday," The New York Daily Times, December 19, 1851.

<sup>40</sup> Henry David Thoreau, A Year in Thoreau's Journal: 1851, New York: Penguin Books, 1993, p.309.

<sup>41</sup> Henry David Thoreau, A Year in Thoreau's Journal: 1851, New York: Penguin Books, 1993, p.309.

<sup>42</sup> "The Weather Throughout the Country," The New York Daily Times, December 25, 1851.

<sup>43</sup> Henry David Thoreau, A Year in Thoreau's Journal: 1851, New York: Penguin Books, 1993, p.312.

<sup>44</sup> Henry David Thoreau, A Year in Thoreau's Journal: 1851, New York: Penguin Books, 1993, p.312.

<sup>45</sup> Henry David Thoreau, A Year in Thoreau's Journal: 1851, New York: Penguin Books, 1993, p.318.

<sup>46</sup> Henry David Thoreau, *A Year in Thoreau's Journal: 1851*, New York: Penguin Books, 1993, pp.318-319.

<sup>47</sup> "The Weather Throughout the Country," The New York Daily Times, December 27, 1851.

<sup>48</sup> "Cold Weather in the East," The New York Daily Times, December 27, 1851.

<sup>49</sup> Henry David Thoreau, A Year in Thoreau's Journal: 1851, New York: Penguin Books, 1993, p.322.

- <sup>50</sup> Henry David Thoreau, A Year in Thoreau's Journal: 1851, New York: Penguin Books, 1993, p.322.
- <sup>51</sup> Henry David Thoreau, A Year in Thoreau's Journal: 1851, New York: Penguin Books, 1993, p.322.

<sup>52</sup> Henry David Thoreau, A Year in Thoreau's Journal: 1851, New York: Penguin Books, 1993, p.324.

<sup>53</sup> "Reports of the Weather Yesterday," *The New York Daily Times*, January 1, 1852.

<sup>54</sup> "Severe Storm at the East—The New York Trains," The New York Daily Times, January 6, 1852.

<sup>55</sup> "The Weather throughout the Country," *The New York Daily Times*, January 6, 1852.

<sup>56</sup> "Storm at the Eastward—Detention of the Mails," *The New York Daily Times*, January 8, 1852.

<sup>57</sup> "The Weather Throughout the Country," The New York Daily Times, January 9, 1852.

<sup>58</sup> "Reports of the Weather on Saturday," The New York Daily Times, January 12, 1852.

<sup>59</sup> "The Weather In the South," *The New York Daily Times*, January 15, 1852.

<sup>60</sup> "Heavy Snow-Storm at New Orleans," The New York Daily Times, January 15, 1852.

<sup>61</sup> "The Weather at New Orleans," The New York Daily Times, January 15, 1852.

<sup>62</sup> "Tremendous Snow Storm at Buffalo," The New York Daily Times, January 14, 1852.

<sup>63</sup> "The Weather In the South," *The New York Daily Times*, January 15, 1852.

<sup>64</sup> "The Snow Storm at Buffalo-Railroads Blocked Up," The New York Daily Times, January 16, 1852.

<sup>65</sup> "A letter from Franconia, NH, says that on Friday morning, the 16 inst., the spirit glass marked 36 degrees below zero—the mercury would have been 33 below. On Saturday, the 17<sup>th</sup>, it was 20 degrees below; the 18<sup>th</sup>, 25 degrees below; and the 19<sup>th</sup> 4 below, with a light fall of snow" in "The Weather in the East," *The New York Daily Times*, January 21, 1852.

<sup>66</sup> David M. Ludlum, "The Famous Susquehanna Ice Bridge of 1852," Weatherwise, January 11, 1998.

<sup>67</sup> David M. Ludlum, "The Famous Susquehanna Ice Bridge of 1852," Weatherwise, January 11, 1998.

<sup>68</sup> "The Weather Yesterday," The New York Daily Times, January 19, 1852.

<sup>69</sup> "Non-Arrival of Trains at Albany—The Weather—The 'Black Swan'—Temperance Celebration, &c.," *The New York Daily Times*, January 20, 1852.

<sup>70</sup> "Good Sleighing," The New York Daily Times, January 20, 1852.

<sup>71</sup> "Ice In The East River," *The New York Daily Times*, January 20, 1852.

<sup>72</sup> "Annual Climatological Summary: Ft. Snelling MN: 1852," at <u>http://climate.umn.edu/doc/twin\_cities/Ft%20snelling/1852sum.htm</u>.

<sup>73</sup> "Annual Climatological Summary: Ft. Snelling MN: 1852," at <u>http://climate.umn.edu/doc/twin\_cities/Ft%20snelling/1852sum.htm</u>.

<sup>74</sup> "The Southern Mail—The Weather in the South," *The New York Daily Times*, January 21, 1852.

<sup>75</sup> "The Weather in the East," *The New York Daily Times*, January 21, 1852.

<sup>76</sup> David Ludlum, *Early American Winters: 1604-1820*, Boston: American Meteorological Society, 1966, pp.276-277.

<sup>77</sup> "The Empire City at New Orleans—Cold Weather," *The New York Daily Times*, January 24, 1852.

<sup>78</sup> "Miscellaneous News," The New York Daily Times, January 23, 1852.

<sup>79</sup> Prof. Cleveland Abbe (ed.), *Monthly Weather Review*, February 1899.

<sup>80</sup> "New York City," The New York Daily Times, January 21, 1852.

<sup>81</sup> "News By The Mails," The New York Daily Times, January 24, 1852.

<sup>82</sup> "Philadelphia," The New York Daily Times, January 22, 1852.

83 "The Pennsylvania Legislature," The New York Daily Times, January 21, 1852.

<sup>84</sup> "Kossuth," The New York Daily Times, January 27, 1852.

<sup>85</sup> "Miscellaneous News," The New York Daily Times, January 23, 1852.

<sup>86</sup> "Methodist Conference—Mr. Philbonnie—The Weather &c.," *The New York Daily Times*, February 7, 1852.

<sup>87</sup> "Alabama," The New York Daily Times, February 18, 1852.

<sup>88</sup> "We are enjoying a perfect carnival of sleighing here [Boston]. We were threatened with a thaw for a few days, but within the last twenty-four hours the snow has been coming down afresh..." in "Boston," *The New York Daily Times*, February 6, 1852.

<sup>89</sup> "Annual Climatological Summary: Ft. Snelling MN: 1852," at <u>http://climate.umn.edu/doc/twin\_cities/Ft%20snelling/1852sum.htm</u>.

<sup>90</sup> "Snow Storm &c.," The New York Daily Times, February 2, 1852.

<sup>91</sup> "Snow Storm at the East—Large Fire near Burlington, Vermont," *The New York Daily Times*, February 2, 1852.

<sup>92</sup> "Snow Storm &c.," The New York Daily Times, February 2, 1852.

<sup>93</sup> "Annual Climatological Summary: Ft. Snelling MN: 1852," at <u>http://climate.umn.edu/doc/twin\_cities/Ft%20snelling/1852sum.htm</u>.

<sup>94</sup> "Annual Climatological Summary: Ft. Snelling MN: 1852," at <u>http://climate.umn.edu/doc/twin\_cities/Ft%20snelling/1852sum.htm</u>.

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<sup>96</sup> "The River at Albany," *The New York Daily Times*, February 13, 1852.

<sup>97</sup> "Annual Climatological Summary: Ft. Snelling MN: 1852," at <u>http://climate.umn.edu/doc/twin\_cities/Ft%20snelling/1852sum.htm</u>.

<sup>98</sup> "Boston," The New York Daily Times, March 4, 1852.

99 "Boston," The New York Daily Times, March 4, 1852.

<sup>100</sup> "Naval News—Ship Philena—Heavy Storm," The New York Daily Times, March 4, 1852.

<sup>101</sup> "Departure of the Steamer City of Glasgow—The Ice in the Susquehanna—Snow Storm," *The New York Daily Times*, March 5, 1852.

<sup>102</sup> "The Weather-Navigation, &c. at Buffalo," *The New York Daily Times*, March 10, 1852.

<sup>103</sup> "The Snow Storm at Philadelphia," The New York Daily Times, March 18, 1852.

<sup>104</sup> "New York City," The New York Daily Times, March 18, 1852.

<sup>105</sup> "Great Fire at Milan, Ohio—Snow," The New York Daily Times, March 24, 1852.

<sup>106</sup> "The Weather," The New York Daily Times, April 1, 1852.

<sup>107</sup> "The first of April was so bright and fair that we half hoped Winter had sent along his last storm for the season with the close of March" in "New York City," *The New York Daily Times*, April 7, 1852.

<sup>108</sup> "The Storm at Baltimore," The New York Daily Times, April 8, 1852.

<sup>109</sup> "Snow Storm at Philadelphia," The New York Daily Times, April 6, 1852.

<sup>110</sup> "New York City," The New York Daily Times, April 7, 1852.

<sup>111</sup> "Violent Snow-Storm—Railroad Collision—Non-arrival of New York Boats," *The New York Daily Times*, April 7, 1852.

<sup>112</sup> "Violent Snow-Storm—Railroad Collision—Non-arrival of New York Boats," *The New York Daily Times*, April 7, 1852.

<sup>113</sup> "The Storm," The New York Daily Times, April 9, 1852.

<sup>114</sup> "The Storm," The New York Daily Times, April 9, 1852.

<sup>115</sup> "The Storm," The New York Daily Times, April 9, 1852.

<sup>116</sup> "The Storm," The New York Daily Times, April 9, 1852.

<sup>117</sup> "Snow Storm in Massachusetts," The New York Daily Times, April 15, 1852.

<sup>118</sup> Providence meteorological records (Source: David Chase).

<sup>119</sup> Providence meteorological records (Source: David Chase).

<sup>120</sup> "Bark Theodore Lincoln—The Storm," The New York Daily Times, April 20, 1852.

<sup>121</sup> "The Gale And The Storm," *The New York Daily Times*, April 20, 1852.

<sup>122</sup> "The Storm," The New York Daily Times, April 20, 1852.

<sup>123</sup> "Great Freshet on the Merrimac River," The New York Daily Times, April 26, 1852.

<sup>124</sup> "Great Freshets—Effects of the Storm—Loss of Life and Destruction of Property," *The New York Daily Times*, April 21, 1852.

<sup>125</sup> "Great Freshets—Effects of the Storm—Loss of Life and Destruction of Property," *The New York Daily Times*, April 21, 1852.

<sup>126</sup> "Snow Storm—Canal Break," The New York Daily Times, April 24, 1852.

<sup>127</sup> "Annual Climatological Summary: Ft. Snelling MN: 1852," at http://climate.umn.edu/doc/twin\_cities/Ft%20snelling/1852sum.htm.

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<sup>129</sup> "Annual Climatological Summary: Ft. Snelling MN: 1852," at <u>http://climate.umn.edu/doc/twin\_cities/Ft%20snelling/1852sum.htm</u>.

<sup>130</sup> Modern records through February 9, 2004 from the National Weather Service.

<sup>131</sup> David Ludlum, *Early American Winters: 1604-1820*, Boston: American Meteorological Society, 1966, pp.272, 276-277.

<sup>132</sup> Sources of information: Unclew (WWBB) and Roger Brickner.

<sup>133</sup> Reconstructed Monthly NAO Index Back to Dec 1658 at <u>ttp://ftp.ngdc.noaa.gov/paleo/historical/north\_atlantic/nao\_mon.txt</u>.

<sup>134</sup> Seattle/King Co. HistoryLink.org: <u>http://www.historylink.org/\_output.CFM?file\_ID=3681</u>.