WIND CHILL CLIMATOLOGY FOR THE NORTH-CENTRAL UNITED STATES

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1. Introduction

During the winter months, the cold can become a significant weather-related health risk, especially to those that live across the colder climate of the Northern Plains. Heightening the risk is the combination of wind with cold temperatures, producing what is known as the “wind chill.” The wind chill is an attempt to quantify the chilling effect of the cold and wind on bare skin.

The wind chill was developed by Paul A. Siple and Charles F. Passel, from work they conducted in Antarctica in the 1940s. Their equation for the wind chill was updated in 2001, through a joint venture between the National Weather Service (NWS) and Environment Canada. This new equation makes use of scientific advances to provide a more accurate measure of the effect of cold and wind on the human body.

The NWS addresses this potentially life threatening hazard by issuing Wind Chill Advisories and Wind Chill Warnings when conditions are expected to approach dangerous criteria. Generally, it has been left to the individual Weather Forecast Offices (WFOs) to decide what these criteria should be for their geographical area of concern.

This study will attempt to show, quantitatively, the frequency of various wind chill values for a section of the United States, focusing on the Plains, Upper and Middle Mississippi River Valleys, and the western Great Lakes.

Other wind chill-related factors that will be briefly investigated include the importance of the wind speed and physiological reactions to cold. The biological response is an important consideration when evaluating the impact of wind chill on those that are acclimated to the cold.

Wind chill values will be deemed “dangerous” when the threat for frostbite is heightened. In this study, -20°F will mark the start of these significant values, as wind chills this cold can cause frostbite within 30 minutes of exposure.

2. Data

Historical weather observations from the National Climatic Data Center (NCDC) were used from 125 locations (Fig.1), extending from Wyoming to Michigan, and from the Canadian-U.S. border south to a Colorado to Kentucky line. The period of record that was initially used was the 1971-2000 climate normals. Due to some data unreliability and station closures, a majority of the sites only had data extending back to 1973. All available observations were analyzed for the winter months of December through February, when the combination of cold and wind would likely produce the lowest wind chills. In addition, as the data set expanded, geographic voids developed. In an attempt to fill these voids, more recent data (1990 to the present) were incorporated into the data set. These additional data were used sparingly to keep the data set as true to the 1971-2000 period as possible.

The data were quality controlled, and observations were eliminated where the temperatures and wind speed were suspect or missing. If there was any question to the integrity in an observation, it was eliminated from the data set.

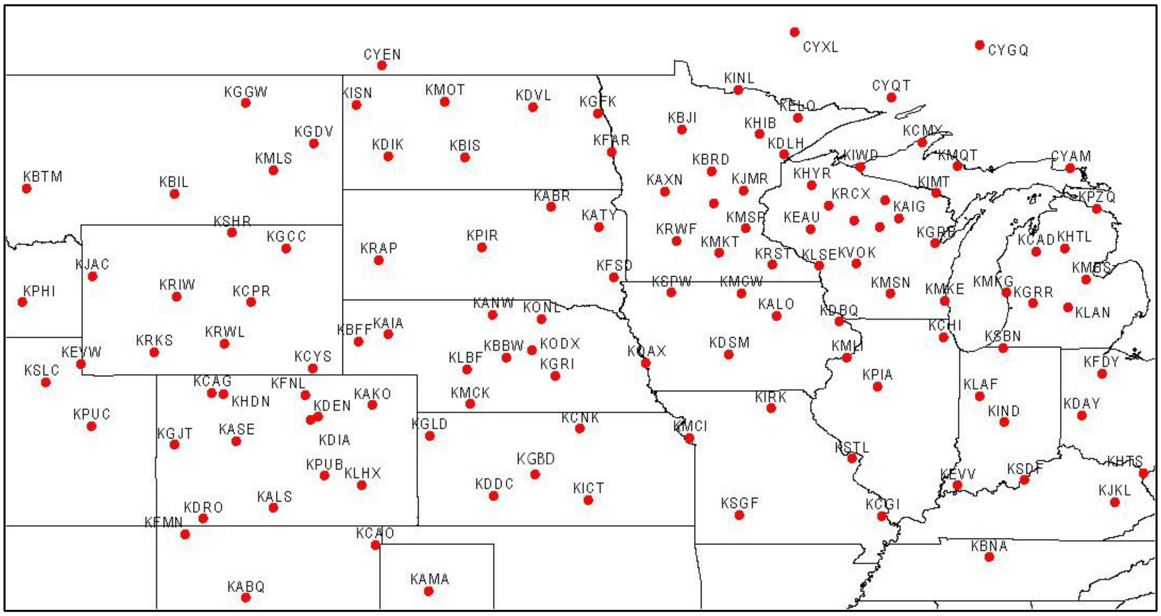

Fig 1. Observation sites used in this study.

The data set was then further filtered, removing observations containing wind speeds less than 10 mph. This speed was chosen as it is the minimum threshold currently used throughout most of the NWS for the issuance of Wind Chill Advisories or Warnings.

Appendix A contains a full listing of the sites used, and related data.

3. Results

Wind chill frequency was calculated over the data domain, every 5 degrees from -20 to -40°F. Forty below zero was used as the most extreme threshold for two reasons: 1) frostbite can occur within 10 minutes of exposure at this wind chill value, and 2) a cursory analysis of the data showed that wind chill values colder than -40°F occurred very infrequently (generally less than 1% of the time), even in the coldest, more wind-prone areas.

Figures 2-6 depict the percentage of time a particular wind chill value was recorded in an observation for the December through February time frame. An apparent maximum runs from North Dakota and northwest Minnesota southward into eastern South Dakota and southwest Minnesota for all wind chill values from -20 to -40°F. There are also maxima over southeast Minnesota and at the western tip of Lake Superior in Minnesota.

The main maximum across the Dakotas and western Minnesota was expected, considering the flat, wide-open terrain and minimal vegetation, along with the latitude and geographic location. These parameters all favor the potential for windy conditions and cold temperatures in the winter.

For the other two maxima in Minnesota, their existence was not as obvious until the data were further inspected. In southeast Minnesota, Rochester is the data point that causes the local percentage maximum in the wind chill data. The observation site in Rochester is located at the airport, on a ridge south of the city, in an open and unsheltered area. This results in wind speeds of 10 mph or greater being observed more than 70% of the time in the historical record (Fig. 7). This is greater than locations in the surrounding area, thus making colder wind chills more likely at this observation point.

Further north on the western tip of Lake Superior, the airport just west of Duluth is the main data point. This airport, like Rochester, shows a propensity for 10 mph or greater wind speeds compared to the surrounding area (Fig. 7). For instance, the historical data show that Duluth experiences these wind speeds 54% of the time (Appendix A), while an average of five sites within approximately 100 miles of Duluth indicate a 25% occurrence of such winds. Also, while much of the arrowhead of Minnesota into northern Wisconsin is heavily forested (Fig. 8), the area around the airport is not. In addition, the airport is located at a higher elevation west of the city on a fairly level plateau (per conversation with NWS Duluth employees), and the prevailing wind direction is from the east in December, turning north to northwest for January and February. An easterly wind direction has some significance as the wind encounters less friction coming across Lake Superior, leading to higher wind speed. Similar to Rochester, these factors make colder wind chills (within the 10 mph wind criteria) more common compared to the surrounding area.

In summary, these two data points skew the figures toward colder wind chill values for the geographic areas surrounding Rochester and Duluth. While these colder wind chills are valid at the locations, they are not as widespread away from the points as the figures would suggest.

Meanwhile, the area from the arrowhead of Minnesota across northern Wisconsin and into the southern Upper Peninsula of Michigan indicates lower frequencies of cold wind chills when high values would appear more likely (e.g., geographical location, latitude). In these areas, the percentage of observations with wind speeds of 10 mph or greater is much less compared with surrounding areas (Fig. 7). Vegetation likely plays a significant role in these lower overall wind speeds as a high percentage of that area is forested (Fig. 8). Unlike the locally high maxima around Rochester and Duluth, this area of lower wind chill value appears representative of the broader area surrounding the observations.

Another maximum (10 mph or greater wind speeds) is evident across the eastern portions of Wyoming and Colorado, in the lee of the Rockies (Fig. 7). This maximum is influenced mostly by the unobstructed terrain of the High Plains, and to a lesser extent, orographic interaction from the Rockies. This propensity for stronger wind results in a slightly higher frequency for cold wind chills (Fig. 2-3) across this area compared to locations just to the east.

In relation to the Rocky Mountains, it should be noted that there is a lack of qualified observations on the mountains and ridges. As a result, the figures do not accurately depict what are likely high percentages of 10 mph or greater winds and cold wind chills in these areas.

A minimum in 10 mph or greater wind speed is noted over southern Nebraska; specifically at North Platte. The observation point is located in the Platte River Valley which limits mixing in the near surface layer until later in the day. Thus, it is not as windy as locations outside the valley. These lower wind speeds, and lower wind chill frequencies, are valid for the valley but not representative of areas away from the valley.

4. Physiological Factors

A common perception is that people who live in colder climates are accustomed to the cold. Therefore, they can withstand colder conditions better than those that live in warmer climates. Research suggests this may be true.

Cold-induced vasodilatation (CIVD) is a bodily mechanism that oscillates blood flow to the extremities upon cold exposure, and is likely associated with the reduced risk of cold injury (i.e., frostbite). Upon exposure to the cold, the body reacts with vasoconstriction of the blood supply to the skin to limit the loss of heat and conserve the body's core heat. However, after a few minutes, vasodilatation occurs, sending a warmer blood flow to the exposed areas to prevent freezing. With continued exposure, alternating periods of vasoconstriction and vasodilatation occur. A strong CIVD response is likely associated with improved manual dexterity and less pain while working in the cold. People who experience repeated peripheral cold exposure while their body core remains warm typically develop enhanced CIVD. While the CIVD response varies between individuals, and is dependent on many factors (age, stress, altitude, diet, etc.), it does suggest that those who are accustomed to the cold have a greater chance of having a higher CIVD. Thus, their bodies would be better equipped to withstand the cold (O'Brien and Frykman 2001, Young 1996, Leftheriotis et al. 1990, Adams and Smith 1962, and LeBlanc and Rosenberg 1957).

In addition, wind speed is important in assessing the impact of cold on the human body. The human body attempts to maintain a constant temperature, and in doing so, a thin thermal layer is created against the skin. In a cold environment, this layer acts as a buffer to the cold air. If this layer is disturbed or destroyed, the body would have to work harder to maintain that temperature since this warmer, protective layer has been replaced by the colder environmental air. The wind can disrupt this protective buffer, making it feel colder. The stronger the wind, the more rapidly the layer is removed, and the colder it feels. As a result, the wind plays a significant role in the "apparent" temperature humans feel and our body's ability to protect ourselves.

These biological processes act to protect the body from the cold, and are a factor in how cold "we feel." When discussing the impacts of the wind chill on humans, biology should be taken into consideration.

5. Summary

A review of historical winter (December through February) observations for 125 locations, mostly across the Plains and Upper and Mid-Mississippi River Valleys, showed a propensity for dangerous wind chills across most of the Dakotas and western Minnesota. Geographical location and relatively low vegetative cover made these areas prone to windy and cold conditions, resulting in more frequent, colder wind chills.

A relative "warm area" for wind chill values, was noted across northeast Minnesota, northwest Wisconsin, and parts of the Upper Peninsula of Michigan. Wind speeds were generally lower there which is believed to be directly related to that area being heavily forested. Therefore, the potential for dangerously cold wind chills is reduced despite cold winter temperatures.

Wind speed is a significant factor in relation to the wind chill and its impact on the human body. The higher the wind speed, the more an insulating warm layer of air is removed from exposed skin, which heightens the risk for cold-related health concerns (such as frost bite). In addition, it appears that individuals more accustomed to colder climates may be better adjusted to withstanding cold temperatures compared to those from warmer climates. Any discussion of the impacts of dangerous wind chills on a populous should take this into consideration.

6. References

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LeBlanc J.A., F.L. Rosenberg, 1957: Local and systemic adaptation to topical cold exposure. *J Appl Physiol*, **11,** 344–348.

Leftheriotis G., G. Savourey, J.L. Saumet, J. Bittel, 1990: Finger and forearm vasodilatatory changes after local cold acclimation. *Eur J Appl Physiol*, **60**, 49–53. [PubMed Citation]

O'Brien C., P. Frykman, 2001: Peripheral Response to Cold: case studies from an arctic expedition. *Wilderness and Environmental Medicine*; **14**, No. 2, pp. 112–119.

Young A.J., 1996: Homeostatic responses to prolonged cold exposure: Human cold acclimatization. *Fregly MJ, Blatteis CM, eds. Handbook of Physiology, Environmental Physiology. Bethesda, MD: American Physiological Society*; 419–438.

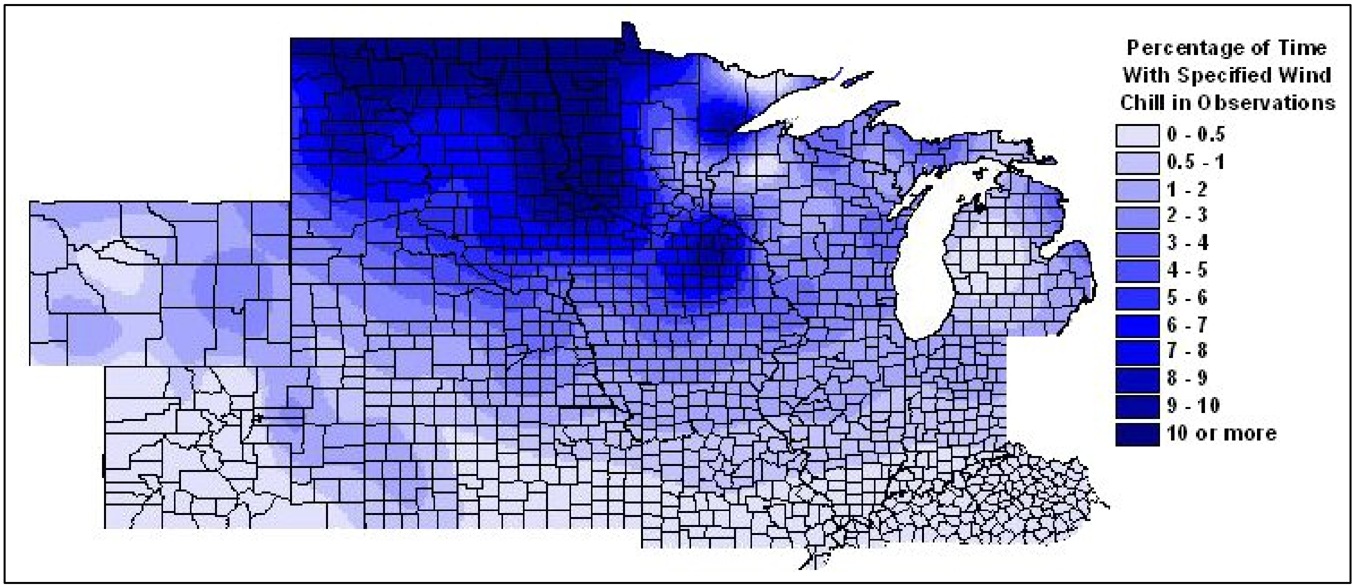

Fig 2. Percent of observations with wind chills -20 F or lower during December through February.

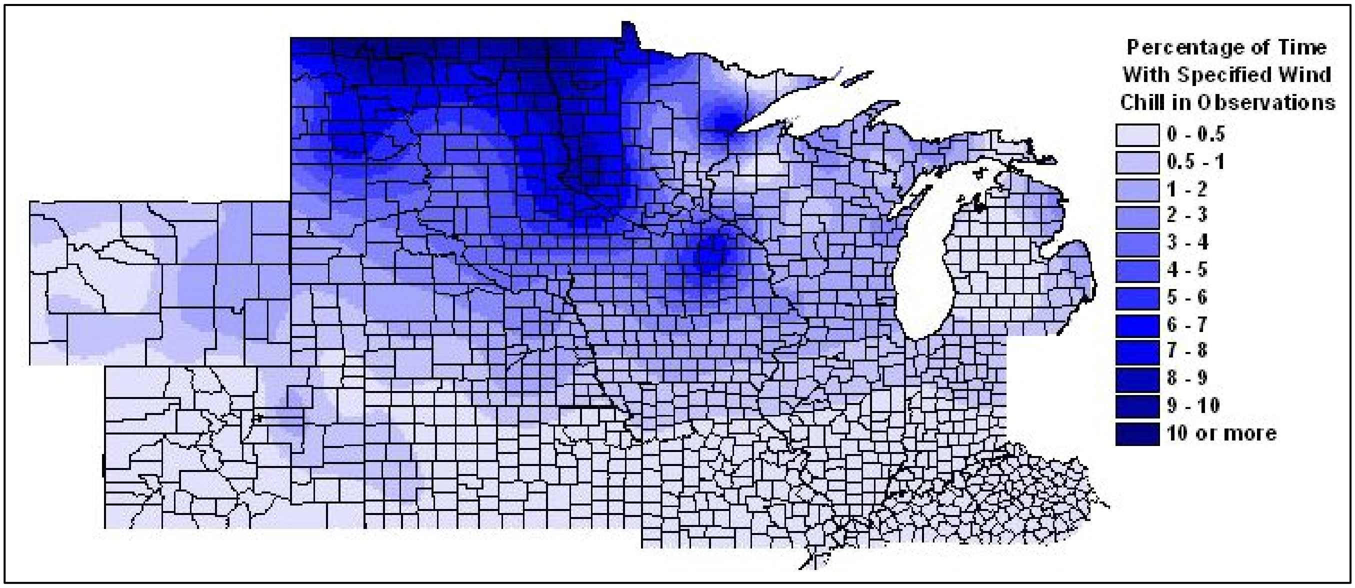

Fig 3. Percent of observations with wind chills -25 F or lower during December through February.

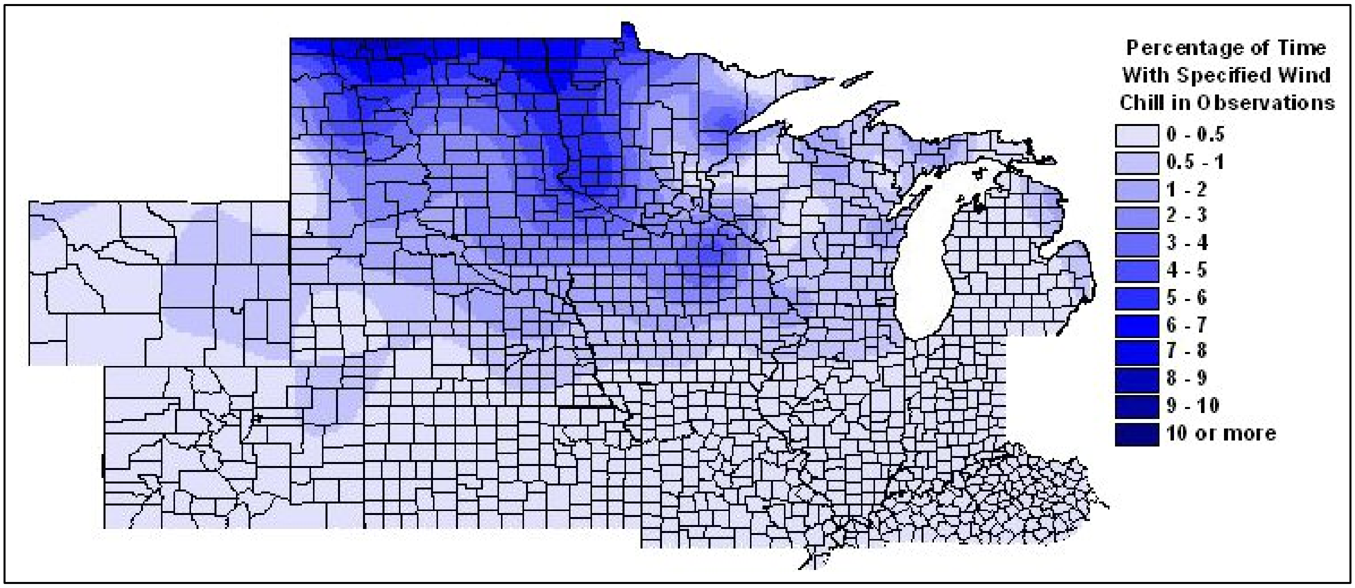

Fig 4. Percent of observations with wind chills -30 F or lower during December through February.

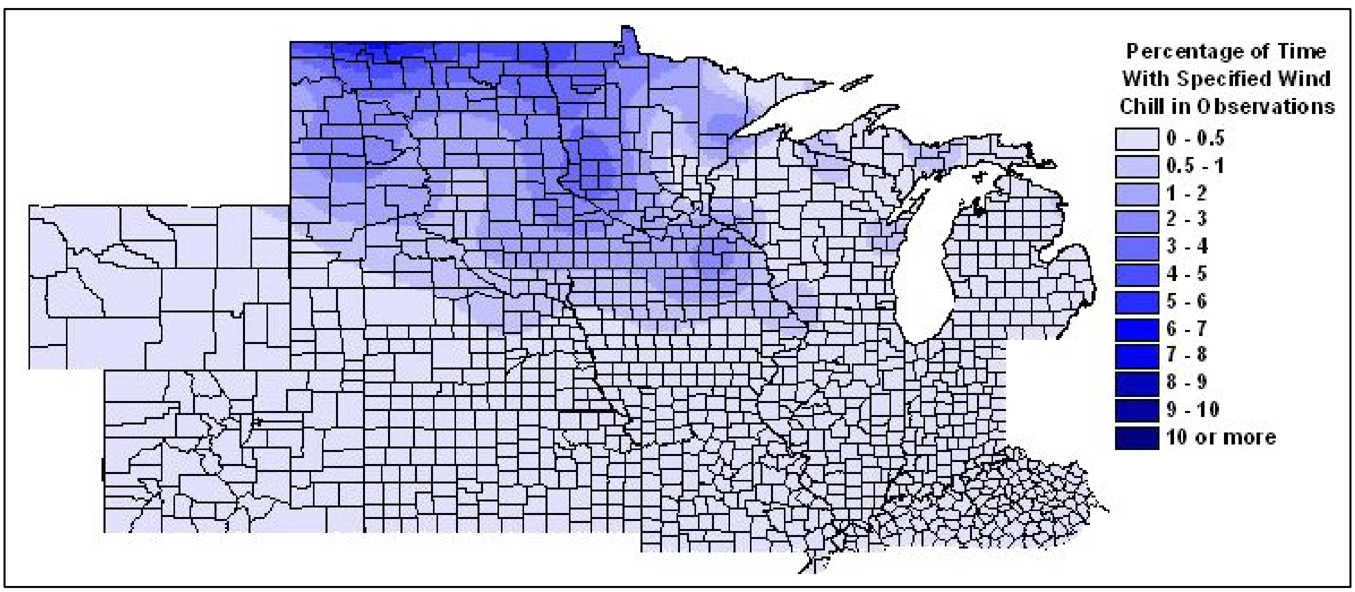

Fig 5. Percent of observations with wind chills -35 F or lower during December through February.

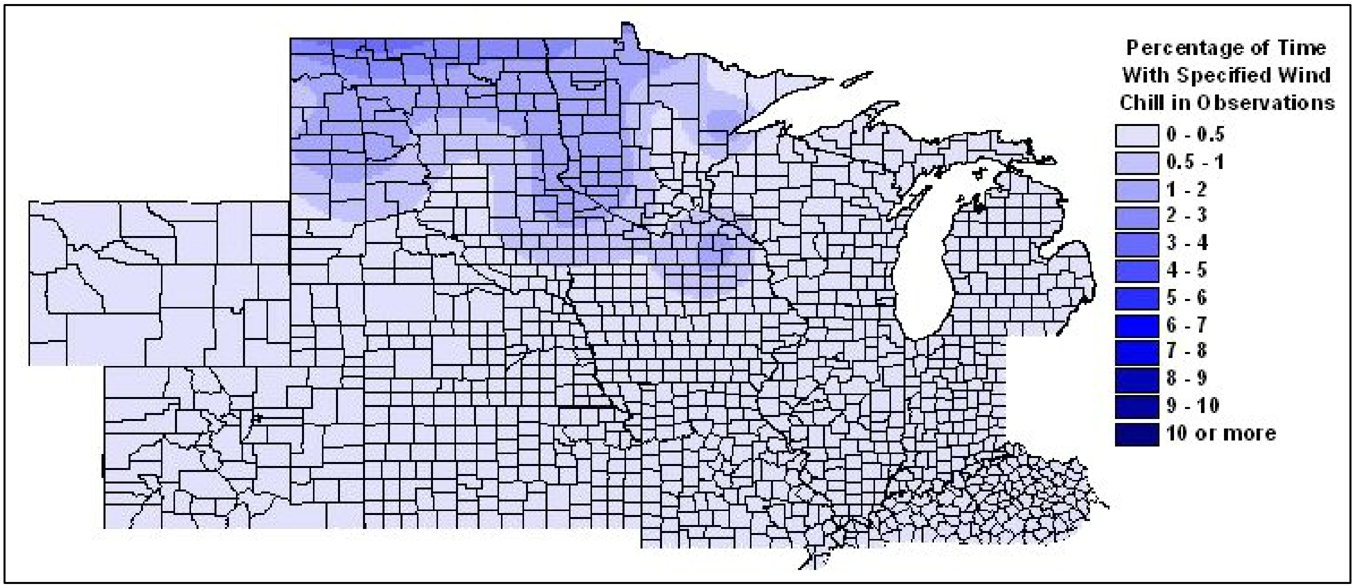

Fig 6. Percent of observations with wind chills -40 F or lower during December through February.

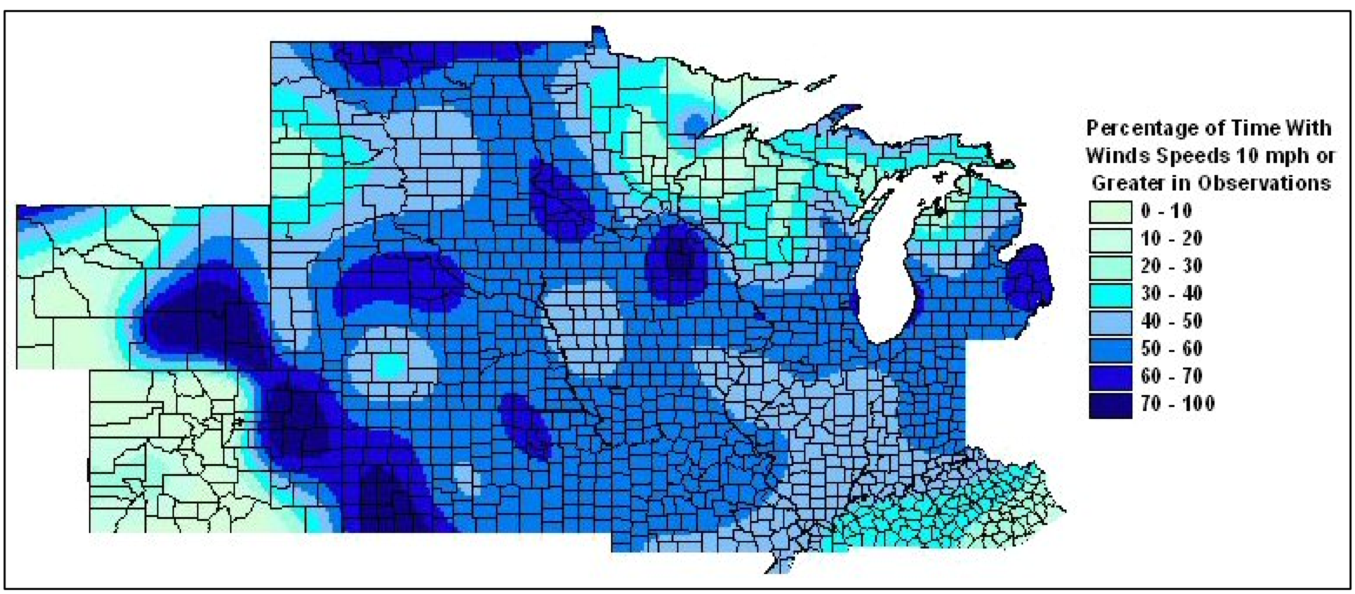

Fig 7. Percentage of observations with 10 mph or greater winds during December through February.

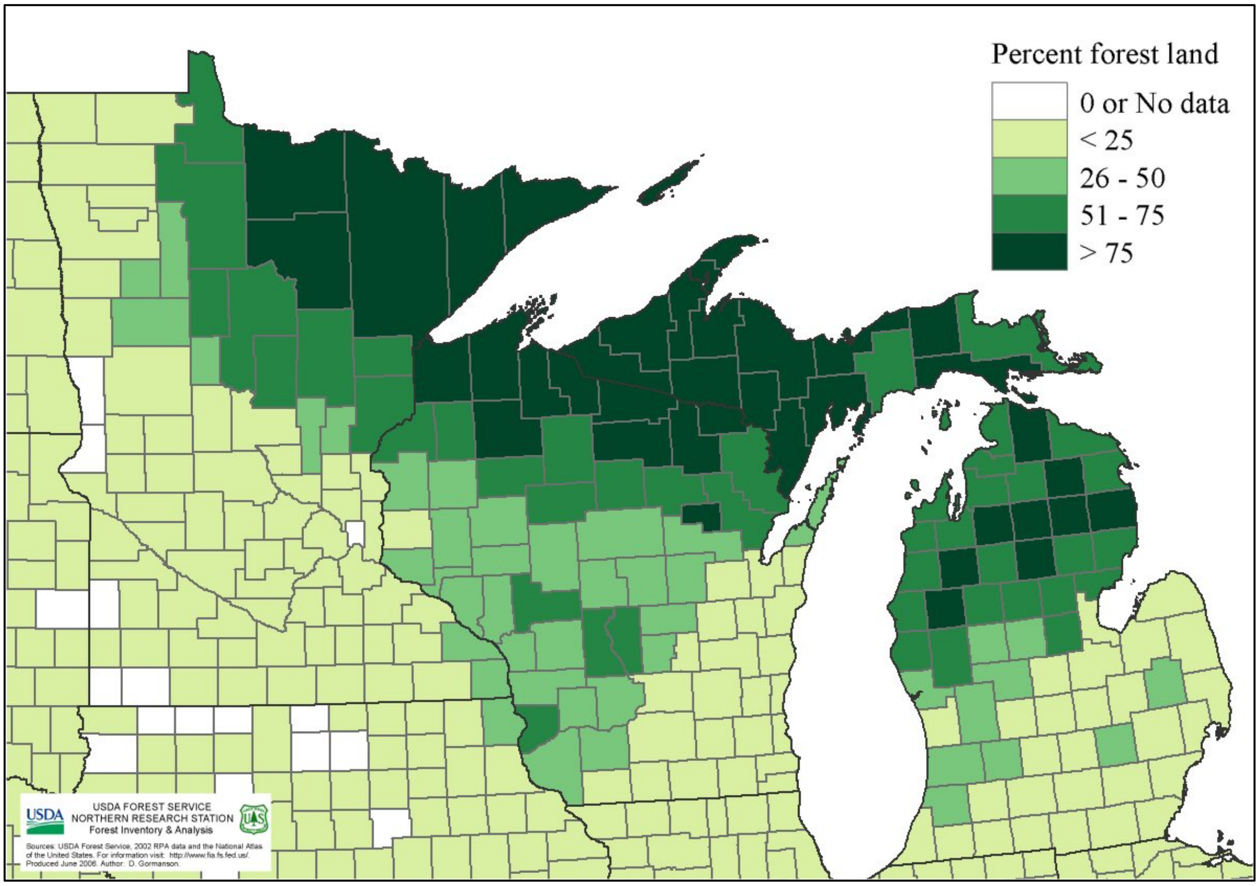

Fig 8. USDA Forest Service image of percentage of land covered in forest (2002).

APPENDIX A

Listing of the observation sites included in this study, with total number of observations (OBS total), number of observations with 10 mph or greater wind speeds (OBS wind), percentage with 10 mph or greater winds (% OBS with wind), and percentage of certain wind chill values meeting the 10 mph criteria (for example, -15 F% represents the percentage of observations that produced -15 F or colder wind chill values in the data set).

Site ID	Name	OBS total	OBS wind	% OBS with wind	-15 F%	-20 F%	-25 F%	-30 F%	-35 F%	-40 F%
KABR	Aberdeen	60162	30137	50.1	10.03	7.09	4.62	2.66	1.27	0.59
KANW	Ainsworth	35565	21720	61.1	4.8	3.27	1.89	0.98	0.46	0.21
KAKO	Akron	53613	31739	59.2	2.35	1.29	0.7	0.31	0.14	0.01
KALS	Alamosa	49170	6919	14.1	0.14	0.09	0.05	0.03	0.02	0.01
KABQ	Albuquerque	58491	14853	25.4	0	0	0	0	0	0
KAXN	Alexandria	58677	32313	55.1	13.87	10.52	7.6	5.12	3.19	1.69
KAIA	Alliance	36031	18870	52.4	2.35	1.33	0.74	0.37	0.2	0.09
KAMA	Amarillo	64364	36962	57.4	0.48	0.2	0.02	0	0	0
KAIG	Antigo	18457	8072	43.7	4.42	2.61	1.5	0.85	0.39	0.16
KASE	Aspen	35851	3910	10.9	0.13	0.06	0.03	0.01	0	0
KBJI	Bemidji	45894	16339	35.6	9.59	7.25	5.15	3.41	2.06	1.05
KBIL	Billings	62637	39747	63.5	4.53	2.81	1.76	0.91	0.47	0.21
KBIS	Bismarck	59104	26184	44.3	10.21	7.56	5.35	3.37	1.92	1.07
KBRD	Brainerd	39841	11415	28.7	5.32	3.76	2.43	1.37	0.73	0.37
KBBW	Broken Bow	30847	14763	47.9	2.76	1.62	0.89	0.46	0.23	0.05
KBTM	Butte	46519	8518	18.3	0.55	0.37	0.23	0.12	0.09	0.07
KCAD	Cadillac	36513	12358	33.8	0.81	0.28	0.07	0.01	0	0
KVOK	Camp Douglass	19601	6367	32.5	3.6	2.41	1.34	0.69	0.3	0.15
KCGI	Cape Girardeau	57620	24970	43.3	0.39	0.19	0.08	0.04	0.01	0
KCPR	Casper	62314	44406	71.3	3.32	2.2	1.43	0.85	0.51	0.29
KCYS	Cheyenne	62844	43080	68.6	2.4	1.44	0.82	0.49	0.21	0.13
KCHI	Chicago	62730	36163	57.6	3.33	1.84	1.13	0.63	0.33	0.19
KCAO	Clayton	65536	35016	53.4	0.39	0.15	0.03	0	0	0
KCNK	Concordia	63934	38152	59.7	2.19	1.16	0.56	0.23	0.1	0.03
KCAG	Craig	50979	5017	9.8	0.09	0.05	0.03	0.02	0.02	0.01
KDAY	Dayton	64921	35774	55.1	1.54	0.87	0.44	0.32	0.21	0.08
KDIA	Den-Stapleton	45987	12808	27.9	0.34	0.19	0.13	0.05	0.02	0
KDEN	Denver	3379	1262	37.3	1.57	1.01	0.59	0.21	0.12	0
KDSM	Des Moines	63124	33028	52.3	5.14	3.26	1.79	0.8	0.39	0.18
KDVL	Devils Lake	54820	30701	56	14.53	10.61	7.57	5.11	3.19	1.83
KDIK	Dickinson	57326	35399	61.8	11.39	8.69	6.29	4.29	2.64	1.45
KDDC	Dodge City	64974	44392	68.3	1.78	0.88	0.4	0.1	0.02	0
KDBQ	Dubuque	50866	30512	60	5.94	3.86	2.28	1.27	0.71	0.32
KDLH	Duluth	63866	34713	54.4	12.65	9.31	6.71	4.35	2.55	1.37
KDRO	Durango	31796	2653	8.3	0.01	0.01	0.01	0	0	0
KEAU	Eau Clairie	58129	20594	35.4	4.69	3.22	1.99	1.19	0.66	0.34
KELO	Ely	57055	9345	16.4	2.26	1.45	1.01	0.65	0.34	0.11
CYEN	Estevan	49500	27478	55.5	18.45	14.97	11.76	8.79	6.29	4.2
KEVW	Evanston	24996	8027	32.1	0.93	0.51	0.26	0.13	0.09	0.06
KEVV	Evansville	59847	24463	40.9	0.47	0.27	0.13	0.05	0.02	0.01
KFAR	Fargo	63550	37034	58.3	15.77	11.6	8.31	5.49	3	1.46
KFMN	Farmington	52971	10703	20.2	0.08	0.03	0	0	0	0
KFDY	Findlay	59529	32032	53.8	2.26	1.23	0.6	0.4	0.26	0.08

Site ID	Name	OBS total	OBS wind	% OBS with wind	-15 F%	-20 F%	-25 F%	-30 F%	-35 F%	-40 F%
KFNL	Fort Collins	19932	2711	13.6	0.1	0.08	0.04	0.03	0.01	0
CYGQ	Geraldton	50679	11725	23.1	8.2	5.99	4.1	2.84	1.78	0.99
KGCC	Gillette	53554	26289	49.1	2.93	1.92	1.14	0.74	0.34	0.18
KGGW	Glasgow	63139	27663	43.8	10.21	7.68	5.46	3.56	2.04	1.11
KGDV	Glendive	19624	7218	36.8	5.57	3.93	2.92	1.98	1.21	0.7
KGLD	Goodland	65079	41624	64	2.3	1.24	0.66	0.26	0.09	0.02
KGFK	Grand Forks	61750	35422	57.4	17.47	13.08	9.52	6.3	3.69	1.77
KGRI	Grand Island	64234	36691	57.1	4.17	2.46	1.39	0.7	0.3	0.11
KGJT	Grand Junction	57980	8472	14.6	0.06	0.02	0.01	0	0	0
KGRR	Grand Rapids	65536	35879	54.7	1	0.36	0.11	0.02	0.01	0
KGBD	Great Bend	18323	9150	49.9	0.64	0.22	0.07	0.03	0.01	0
KGRB	Green Bay	62566	30360	48.5	5.45	3.62	2.22	1.16	0.61	0.31
KCMX	Hancock	54438	28533	52.4	5.88	3.08	1.59	0.75	0.3	0.13
KHDN	Hayden	30093	5651	18.8	1.24	0.54	0.21	0.13	0.07	0.01
KHYR	Hayward	24709	2534	10.3	0.25	0.13	0.06	0.01	0	0
KHIB	Hibbing	57633	22111	38.4	9.41	6.64	4.43	2.83	1.69	0.91
KHTL	Houghton Lake	51422	21937	42.7	1.37	0.55	0.23	0.11	0.05	0.01
KHTS	Huntington	62172	15259	24.5	0.3	0.2	0.13	0.06	0.03	0
KIND	Indianapolis	63871	33950	53.2	1.58	0.83	0.42	0.31	0.2	0.1
KINL	International Falls	60886	21629	35.5	9.58	7.18	5.01	3.23	1.95	1.07
KIMT	Iron Mountain	38907	9932	25.5	2.23	1.36	0.81	0.42	0.22	0.14
KIWD	Ironwood	40793	13382	32.8	5.44	3.68	2.44	1.35	0.66	0.35
KJAC	Jackson	35215	9011	25.6	1.05	0.73	0.49	0.28	0.14	0.05
KJKL	Jackson, KY	52324	12353	23.6	0.22	0.16	0.12	0.08	0.03	0
KMCI	Kansas City	62057	34401	55.4	1.85	0.93	0.5	0.28	0.1	0.05
KIRK	Kirksville	41086	22796	55.5	2.57	1.48	0.68	0.35	0.21	0.08
KLSE	La Crosse	54938	22188	40.4	4.25	2.76	1.62	0.89	0.52	0.29
KLHX	La Junta	56660	19553	34.5	1.01	0.54	0.32	0.14	0.05	0.01
KRCX	LadySmith	49242	12916	26.2	2.08	1.35	0.82	0.47	0.25	0.1
KLAF	Lafayette	60326	29586	49	1.97	1.02	0.5	0.31	0.2	0.09
KLAN	Lansing	62754	34952	55.7	1.45	0.63	0.29	0.1	0.03	0.01
KSDF	Louisville	63028	26300	41.7	0.45	0.26	0.16	0.06	0.02	0
KMSN	Madison	61072	29949	49	4	2.4	1.23	0.75	0.38	0.2
KMKT	Mankato	34785	18574	53.4	8.53	5.91	3.73	2.35	1.22	0.57
KMQT	Marquette	36065	16847	46.7	6.02	3.67	2.03	1.16	0.59	0.23
KMCW	Mason City	59623	38720	64.9	10.74	7.72	5.31	3.33	1.7	0.8
KMCK	McCook	36478	18301	50.2	1.53	0.79	0.4	0.13	0.04	0.01
KMDZ	Medford	37526	12060	32.1	2.58	1.44	0.84	0.32	0.09	0.02
KMLS	Miles City	52395	20336	38.8	4.36	2.92	1.82	1.14	0.71	0.39
KMKE	Milwaukee	63318	38782	61.2	4.61	2.58	1.38	0.73	0.36	0.19
KMSP	Minneapolis	62207	30403	48.9	7.01	4.61	2.81	1.57	0.83	0.45
KMOT	Minot	60713	39095	64.4	16.39	12.59	9.4	6.56	4.17	2.27
KMLI	Moline	61428	31366	51.1	3.82	2.26	1.3	0.69	0.37	0.2
KJMR	Mora	17017	2969	17.4	2.48	1.55	0.82	0.47	0.24	0.14
KMKG	Muskegon	65535	39705	60.6	0.99	0.37	0.13	0.04	0.01	0
KBNA	Nashville	62680	23894	38.1	0.22	0.13	0.05	0.03	0	0
KLBF	North Platte	60464	23211	38.4	2.46	1.43	0.82	0.43	0.18	0.07
KOAX	Omaha	56957	28129	49.4	3.92	2.51	1.19	0.72	0.33	0.16
KONL	O'Neill	18112	10686	59	5.6	4.01	2.5	1.38	0.68	0.23

Site ID	Name	OBS total	OBS wind	% OBS with wind	-15 F%	-20 F%	-25 F%	-30 F%	-35 F%	-40 F%
KODX	Ord	20030	11094	55.4	3.44	2.2	1.23	0.77	0.39	0.15
KPIA	Peoria	64159	31540	49.2	2.78	1.55	0.74	0.44	0.25	0.11
KPIR	Pierre	62010	34316	55.3	8	5.4	3.38	1.91	1.01	0.4
KPHI	Pocatello	62188	23238	37.4	0.35	0.21	0.11	0.04	0	0
KPUC	Price	36646	3699	10.1	0.11	0.03	0.01	0	0	0
KPUB	Pueblo	60580	16163	26.7	0.22	0.12	0.06	0.01	0	0
KRAP	Rapid City	61423	27731	45.1	4.63	3.03	1.77	1.02	0.58	0.32
KRWL	Rawlins	46862	33214	70.9	2.1	1.24	0.85	0.49	0.28	0.15
KRWF	Redwood Falls	55696	33473	60.1	11.37	7.99	5.38	3.38	1.81	0.81
KRHI	Rhinelander	37069	10969	29.6	4.4	2.97	1.91	1.17	0.57	0.26
KRIW	Riverton	32829	6316	19.2	0.51	0.34	0.16	0.11	0.07	0.04
KRST	Rochester	65228	47266	72.5	13.21	9.47	6.57	4.22	2.44	1.25
KRKS	Rock Springs	24313	10548	43.4	1.99	1.28	0.7	0.34	0.14	0.03
KPZQ	Rogers City	21266	8203	38.6	5.52	3.37	2.01	1.12	0.48	0.21
KMBS	Saginaw	58511	33332	57	2	0.8	0.38	0.15	0.05	0.01
KSLC	Salt Lake City	65534	15715	24	0.15	0.08	0.03	0	0	0
CYAM	Sault Ste Marie	32152	10728	33.4	1.56	0.8	0.31	0.18	0.07	0.03
KBFF	Scottsbluff	60552	27576	45.5	1.9	1.16	0.72	0.46	0.25	0.14
KSHR	Sheridan	55813	15406	27.6	1.94	1.23	0.8	0.44	0.19	0.09
KFSD	Sioux Falls	62013	33720	54.4	7.81	5.36	3.74	2.25	1.17	0.59
CYXL	Sioux Lookout	39727	10737	27	9.7	7.58	5.45	3.84	2.48	1.49
KSBN	South Bend	64847	36571	56.4	2.6	1.39	0.79	0.46	0.2	0.07
KSPW	Spencer	42815	21441	50.1	6.92	4.68	3.06	1.84	0.93	0.43
KSGF	Springfield	63742	32800	51.5	0.69	0.33	0.14	0.05	0.01	0
KSTC	St Cloud	44465	15087	33.9	6.17	4.39	2.98	1.79	0.94	0.4
KSTL	St Louis	63286	33408	52.8	1.34	0.68	0.35	0.19	0.07	0.04
CYQT	Thunder Bay	49267	13290	27	8.41	6.24	4.38	2.94	1.63	0.81
KALO	Waterloo	61589	35341	57.4	7.23	4.99	3.15	1.75	0.84	0.4
KATY	Watertown	52548	30600	58.2	12.99	9.37	6.41	4.07	2.33	1.2
KAUW	Wausau	39421	12391	31.4	2.71	1.73	1	0.55	0.2	0.08
KICT	Wichita	62929	34573	54.9	0.05	0	0	0	0	0
KISN	Williston	61202	26723	43.7	10.4	7.79	5.58	3.81	2.39	1.35