

# Winter Severity Indices 2007-2008

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## **Abstract**

This report details the Winter Severity Index (WSI) monitoring for the northern forest region of Wisconsin during the winter 2007-2008. Region-wide, this winter was rated as moderate. Average WSI was 70 compared to a 30-year average of 56. Moderate to very severe conditions were reported at 21 of 31 stations throughout northern Wisconsin with most severe readings recorded from Iron and Price counties and eastward. Despite widespread moderately severe winter severity values, region-wide weather impacts on the 2008 fawn cohort are expected to be relatively minor.

## **Background and Methods** (Wisconsin Department of Natural Resources 2001)

Prior to 1975, Wisconsin did not have a formal procedure for measuring winter severity and predicting its impact on deer herds. Michigan was using a severity index that used calorimeters to estimate a winter air-chill factor, and snow depth and sinking-depth measurements to estimate a snow-hazard factor (Verme 1968). The air-chill and snow-hazard factors were summed at the end of each week to derive a cumulative severity index. Ontario was using the Passmore-Hepburn Method, which also entails relatively complex snow measurements (Passmore and Hepburn 1955).

Our winter severity index (WSI) was developed after testing several procedures for quantifying winter conditions (Kohn 1975). It used the number of days with a minimum temperature of 0°F or below as a measure of winter air-chill, and the number of days with 18 or more inches of snow on the ground to estimate the snow hazard. Days when both conditions occurred are scored as 2. These are added together from 1 December through 30 April to obtain the WSI. US Department of Commerce (USDC) weather data were initially used to measure winter severity because they were easily obtained, and initially allowed us to compare WSI for previous winters with historical deer data (i.e. results of dead deer surveys, Summer Deer Observations, and buck harvests). The WSI was calculated for each of 12 USDC stations and then averaged to obtain the Northern Forest WSI.

Beginning in the winter of 1986-87, weather data were collected at 35 DNR stations across the North (Figure 1). Since 1999-2000, four stations were discontinued (Iron River, Cumberland, Medford, and Pound) and one new station was added (New Wood). Daily snow depths and minimum temperatures were recorded at these stations from 1 December through 30 April on a standardized form, and this information was sent to the Northern Wildlife Research Group at the end of each month. Survey instructions request that the presence of crusts be recorded. To date, information on crusts has not been incorporated into the index, but this information may affect our interpretation of the index.

WSI values for the Northern Forest from 1960-61 through 2007-08 are shown in Figure 2. Winters are considered “mild” if the calculated WSI is less than 50, “moderate” if it is between 50 and 80, “severe” if it is between 80 and 100, and “very severe” if the WSI exceeds 100. These designations are based on observed associations between WSI and winter mortality, fawn production, and buck harvest during the following year (Wisconsin Department of Natural Resources 2001:5.11).

## **Results**

The region-wide winter of 2007-2008 rated as moderate. The average WSI across 28 stations with complete reporting was 70.1 (SE = 6.0) compared with a 30-yr average of 56 (s = 30). Forty-three (61%) of the generated WSI "points" were "temperature" points and most of these were accumulated during December and January (Fig. 3). Twenty-seven (39%) of the WSI points were "snow" points accumulated mostly during February and March (Fig. 3). Low temperatures occurred early and continued throughout the winter, however, January and February were the coldest months (Table 1).

Among 28 individual stations with complete records, 8 reported WSIs reflective of moderate conditions ( $50 < \text{WSI} < 80$ ), 6 reported moderately severe conditions ( $80 < \text{WSI} < 100$ ), and 7 reported very severe conditions ( $\text{WSI} > 100$ ; Table 1). The area experiencing  $\text{WSI} \geq 80$  encompassed a large region in northeastern WI extending from Iron and Price counties and eastward through Forest and Florence counties. Moderate readings were recorded throughout Barron, Rusk, southern Langlade, and northern Marinette counties. Elsewhere, mostly mild conditions prevailed. This was the first moderate winter in northern Wisconsin after a succession of three mild winters.

## **Discussion**

Region-wide the winter of 2007-08 was not severe enough to cause excessive winter mortality or depressed fawn production during spring 2008. Despite regionally moderate to very severe winter severity values throughout most of northern Wisconsin, severe winter conditions were gone by April when deer are particularly vulnerable to winter effects. Thus, a relatively robust fawn age class is expected during 2008. However, robust regional reproduction does not preclude local deer populations from effects of winter weather, particularly where winter conditions were severe or moderately severe (Iron, Price, Oneida, Lincoln, Langlade, Forest, Florence counties) and reports of distressed and dead deer (particularly fawns) were reported. Recruitment predictions and antlerless harvest predictions for Fall 2008 were adjusted based on predicted deer herd responses to comparable historic winter conditions. Despite an increased proportion of yearling deer of both sexes in the 2007 harvest (Wisconsin Department of Natural Resources 2008), subsequent declines in yearling recruitment in regions locally impacted by winter effects are possible and warrant continued monitoring.

## **Acknowledgments**

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## **Literature Cited**

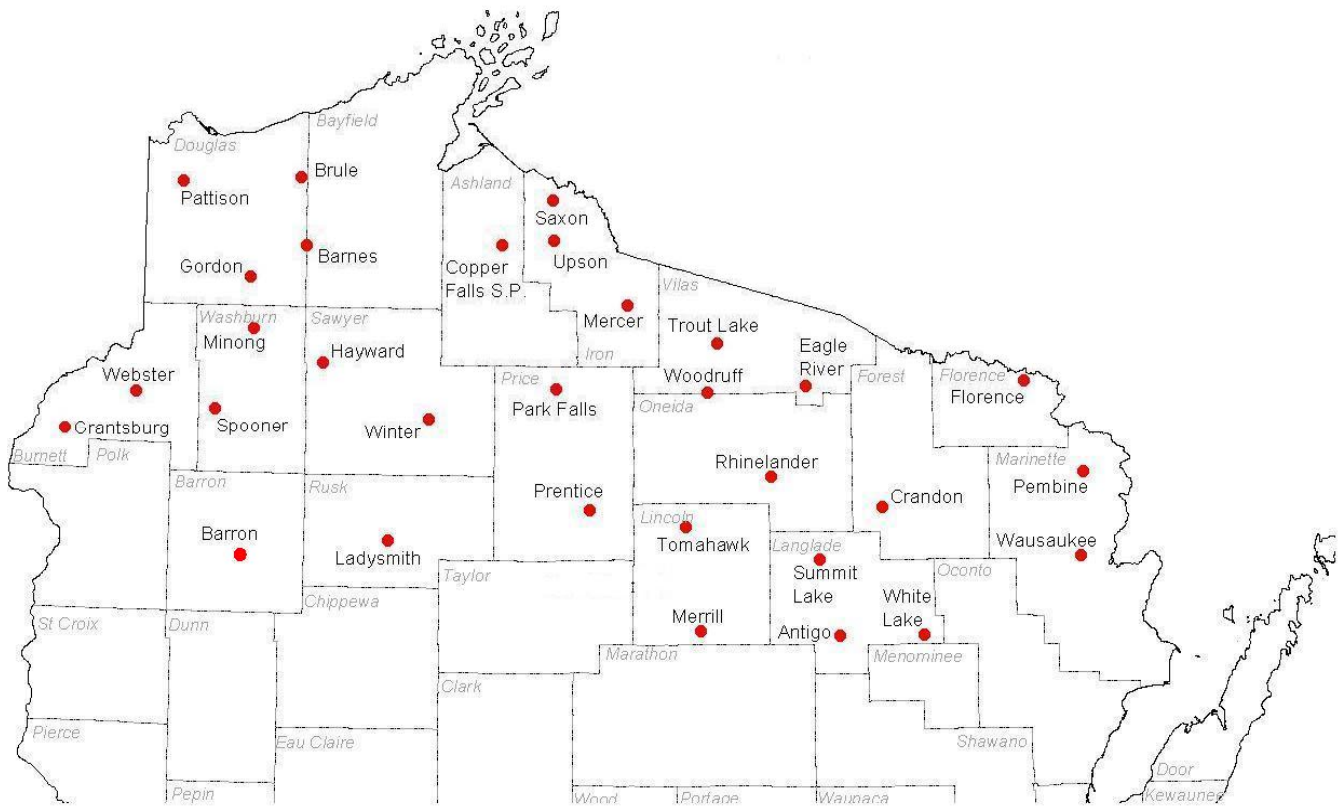
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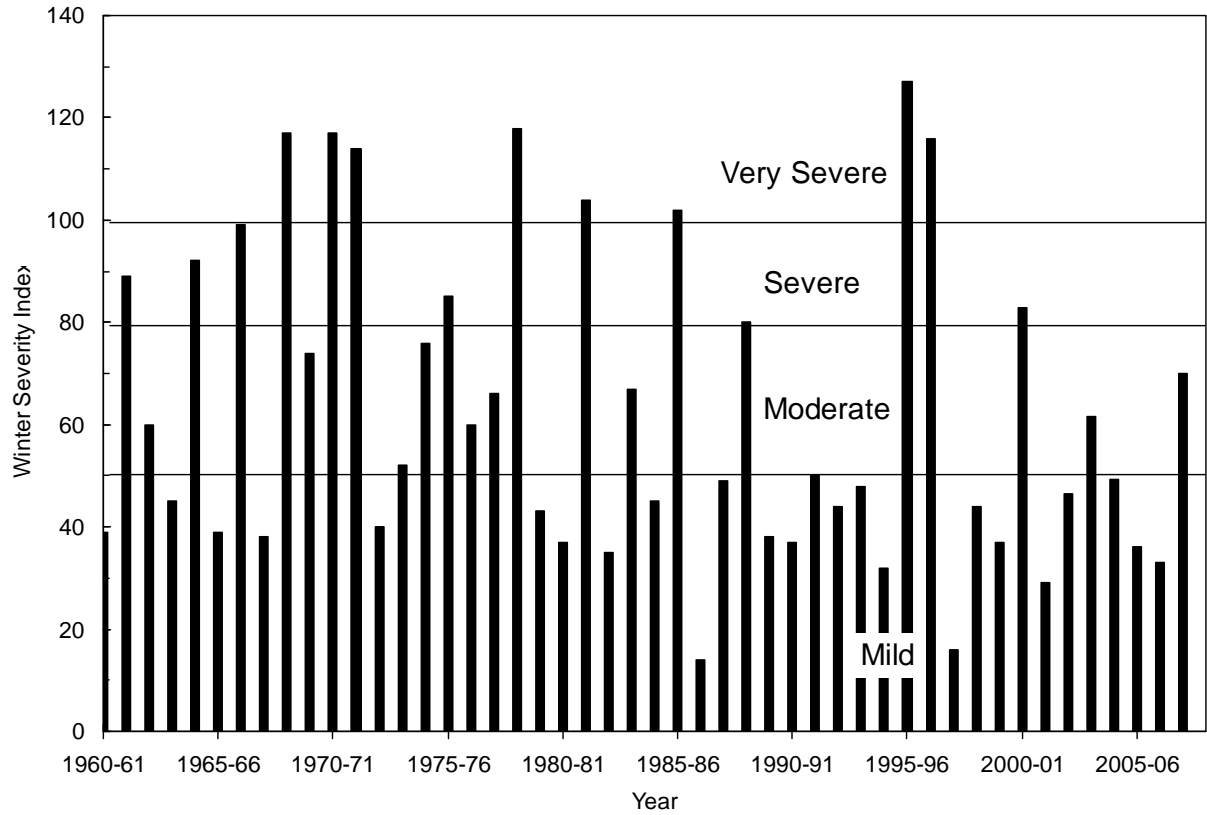
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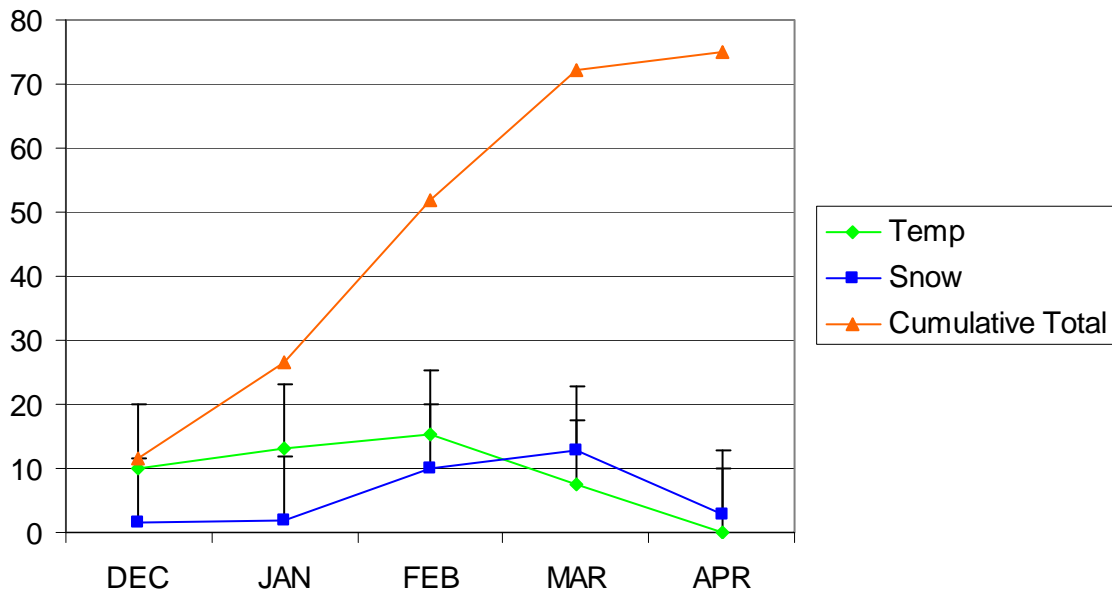
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**Figure 1.** Location of winter severity index recording stations, 2007-2008.



**Figure 2.** Winter Severity Indices 1960-1961 to 2007-2008.



**Figure 3.** WSI trend during 2007-2008. Error bars represent  $\pm 1$  SD.

**Table 1.** WSI data reported for 2007-2008. TEMP = number of days with temperatures  $\leq 0^{\circ}$  F, SNOW = number of days with snow depths  $\geq 18$  inches.

STATION	DECEMBER		JANUARY		FEBRUARY		MARCH		APRIL		TOTAL		
	TEMP	SNOW	TEMP	SNOW	TEMP	SNOW	TEMP	SNOW	TEMP	SNOW	TEMP	SNOW	TOTAL
Antigo	8	0	11	0	16	8	8	0	0	3	43	11	54
Barnes	9	0	13	0	[16]	[0]	[8]	[0]	[0]	[0]	46	0	46
Barron	13	0	18	0	18	0	9	0	0	0	58	0	58
Brule	10	2	15	0	16	0	8	0	0	0	49	2	51
Copper Falls S.P.	11	0	12	0	15	1	9	0	0	0	47	1	48
Crandon	11	0	14	0	17	25	5	31	0	4	47	60	107
Eagle River	8	0	11	0	15	16	8	25	0	4	42	45	87
Florence East	10	0	12	0	20	16	7	14	0	4	49	34	83
Gordon*	14	0	14	0	17	0	8	0	0	0	53	0	53
Grantsburg	11	0	14	0	12	0	7	0	0	0	44	0	44
Hayward	9	0	15	0	16	0	6	0	0	0	46	0	46
Ladysmith	11	6	17	4	17	0	10	0	0	0	55	10	65
Mercer	9	6	11	6	15	26	10	31	0	8	45	77	122
Merrill	14	0	14	0	15	16	6	31	0	5	49	52	101
Minong	10	0	16	0	15	0	7	0	0	0	48	0	48
Park Falls	12	5	12	0	17	16	7	31	0	6	48	58	106
Pattison	9	2	16	0	12	0	10	0	0	0	47	2	49
Pembine	11	0	13	0	18	12	6	2	0	0	48	14	62
Prentice	10	3	12	0	13	16	6	31	0	5	41	55	96
Rhineland	9	0	11	0	15	23	7	31	0	5	42	59	101
Saxon	8	9	9	8	15	0	8	0	0	0	40	17	57
Spooner	7	0	12	0	12	0	6	0	0	0	37	0	37
Summit Lake	9	0	12	4	16	27	8	31	0	11	45	73	118
Tomahawk	11	0	13	0	14	13	9	30	0	5	47	48	95
Trout Lake	[4]	[0]	[0]	[1]	[9]	[8]	[3]	[16]	[0]	[0]	16	25	41
Upson	9	9	11	27	17	29	11	31	0	11	48	107	155
Wausaukee	6	0	11	0	14	5	5	0	0	0	36	5	41
Webster	9	0	15	0	12	0	6	0	0	0	42	0	42
White Lake	9	0	12	0	16	13	8	21	0	3	45	37	82
Winter	11	6	14	5	16	8	8	2	0	0	49	21	70
Woodruff	[9]	[0]	[11]	[0]	14	17	8	31	0	3	42	51	93
Averages	9.93	1.66	13.10	1.86	15.34	9.90	7.62	12.86	0.00	2.66	43.03	27.06	70.10
SE	0.35	0.54	0.39	0.98	0.37	1.85	0.29	2.72	0.00	0.62	2.01	5.46	6.02

[ ] denotes data not included in averages