



Department of Natural Resources
Wildlife Report No.: 3374

WINTER SEVERITY INDEX 2001 – 2002

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The Wildlife Division of the Michigan Department of Natural Resources (DNR) has the authority and responsibility to protect and manage the wildlife resources of the State of Michigan. By measuring winter severity, biologists can determine its possible effects on wildlife species, especially white-tailed deer (*Odocoileus virginianus*). White-tailed deer populations in many parts of Michigan are on the northern edge of their geographic range and often suffer mortality during severe winters (Verme 1968).

Determining the effects of winter weather on white-tailed deer abundance, reproductive success, growth and survival rates, and hunter harvest is an important part of Michigan's deer management program. The DNR monitors the winter severity using a Winter Severity Index (WSI). The index measures the combined effects of air chill and snow hazard (Verme 1968). This report summarizes results of the WSI for the winter of 2000-2001.

METHODS

In 2001, the DNR collected WSI data from 11 stations in the Upper Peninsula, 9 in the Northern Lower Peninsula, and 7 in the Southern Lower Peninsula (Figure 1). The recording period started the week of 5 November in the Upper Peninsula and 3 December for the Lower Peninsula. The recording period ended on 30 April 2002 for all areas of the state. Field personnel near WSI stations recorded weekly WSI scores and weather conditions. Deer activity in wintering habitat and physical condition was monitored by field staff during their daily activities and included in the weekly reports.

The winter severity was determined by using a chillometer and snow compaction gauge, which measured air chill and snow hazard, the principle factors affecting white-tailed deer during winter (Verme 1968). These factors added together determine the weekly severity index. The cumulative total for the recording period represents the winter severity.

Air chill was measured using a chillometer, a calorimetric device designed to provide a continuous record of atmospheric chill (Verme 1968). The weekly air chill rating was the number of kilowatt-hours needed to maintain water inside the chillometer at 39 degrees Fahrenheit. If the wind speed was high or temperatures were low, more electricity was needed to keep water at the desired temperature, thus reflecting more extreme weather conditions for wildlife.



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Snow hazard was determined using a compaction gauge, a 2-foot by 1-inch diameter copper tube, weighing 3 pounds, marked in tenths-of-feet (Verme 1968). This tube simulated the force exerted on the snow surface by the weight of a standing deer. The compaction gauge was lowered until its base touched the snow and then released. The distance it fell through the snow represented an index to support for deer.

RESULTS AND DISCUSSION

According to the WSI the Upper Peninsula and Northern Lower Peninsula experienced the 4th mildest winter on record and the least severe for the Southern Lower Peninsula (Table 1, Figure 2). Early winter conditions were very mild across the state with winter storms dumping large accumulations of snow (National Weather Service data). Mild temperatures often followed winter storms melting snow rapidly and keeping the seasonal WSI relatively low. This up and down trend is demonstrated by the weekly average WSI values for each region of the state (Figure 3).

During early to mid winter, deer in the Upper Peninsula were in good shape and able to move freely throughout the region with some deer moving toward winter cover. Winter stress on deer started to increase in March with lower temperatures and increased snow depth. Deer in the snow belt regions were becoming more restricted near yards while deer in other regions remained widespread and able to move freely. Record warmth in April rapidly melted snow cover causing widespread flooding in the western Upper Peninsula, but allowed deer to begin to break up and return to summer ranges.

Winter conditions in the Lower Peninsula presented few challenges for deer. Mild conditions kept the region relatively snow free allowing deer to easily locate resources. Colder March weather caused some deer to form groups around cover and food, but they were still able to move freely. Record warmth in April marked the beginning of spring green up with deer dispersing throughout their spring and summer ranges.

Based on the lower than average winter severity readings and few reports of dead deer it seems the deer herd was not negatively affected by winter. Record early warmth allowed deer to remain on summer ranges longer where food was still available. In many areas winter weather did not restrict movement to deer yards or concentration areas keeping deer widespread and able to locate food and cover. Although spring weather was somewhat delayed in March, it did not restrict deer to dense cover and many were able to move back to spring and summer ranges.

LITERATURE CITED

Verme, L. J. 1968. An index of winter weather severity for northern deer. J. Wildl. Manage. 32:566-574.

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Table 1. Seasonal WSI value for each region from 1969 - 2001
(adjusted for weeks 1 - 22 from December 1).

Year	Upper Peninsula	Northern Lower Peninsula	Southern Lower Peninsula
1969	117.85	72.85	
1970	134.60	85.08	
1971	140.64	74.70	
1972	83.39	54.66	
1973	102.86	66.03	
1974	105.05	64.85	
1975	106.82	77.84	
1976	129.30	88.80	
1977	114.14	88.08	
1978	143.48	82.24	
1979	83.53	56.22	
1980	89.46	73.15	
1981	133.40	101.12	
1982	69.10	43.42	
1983	113.35	77.18	
1984	103.97	69.74	
1985	119.68	75.78	
1986	65.70	42.34	
1987	99.85	50.64	
1988*	103.03	63.74	43.74
1989	92.26	60.79	49.68
1990	74.12	57.15	43.57
1991	81.65	55.86	43.92
1992**	81.65	63.46	50.31
1993**	88.13	79.19	67.61
1994**	71.04	52.99	46.61
1995**	120.44	77.19	55.47
1996**	107.34	67.41	50.48
1997**	57.98	37.80	35.07
1998**	77.25	49.27	47.18
1999**	65.82	49.21	39.22
2000**	101.30	66.13	59.37
2001**	68.95	44.00	30.83
AVERAGE	99.32	66.40	48.63
STD	23.75	15.18	9.43

* First year WSI was expanded statewide

** UP WSI adjusted for start date of Dec. 1



Figure 1. Winter severity index data collection points for 2001 - 2002.

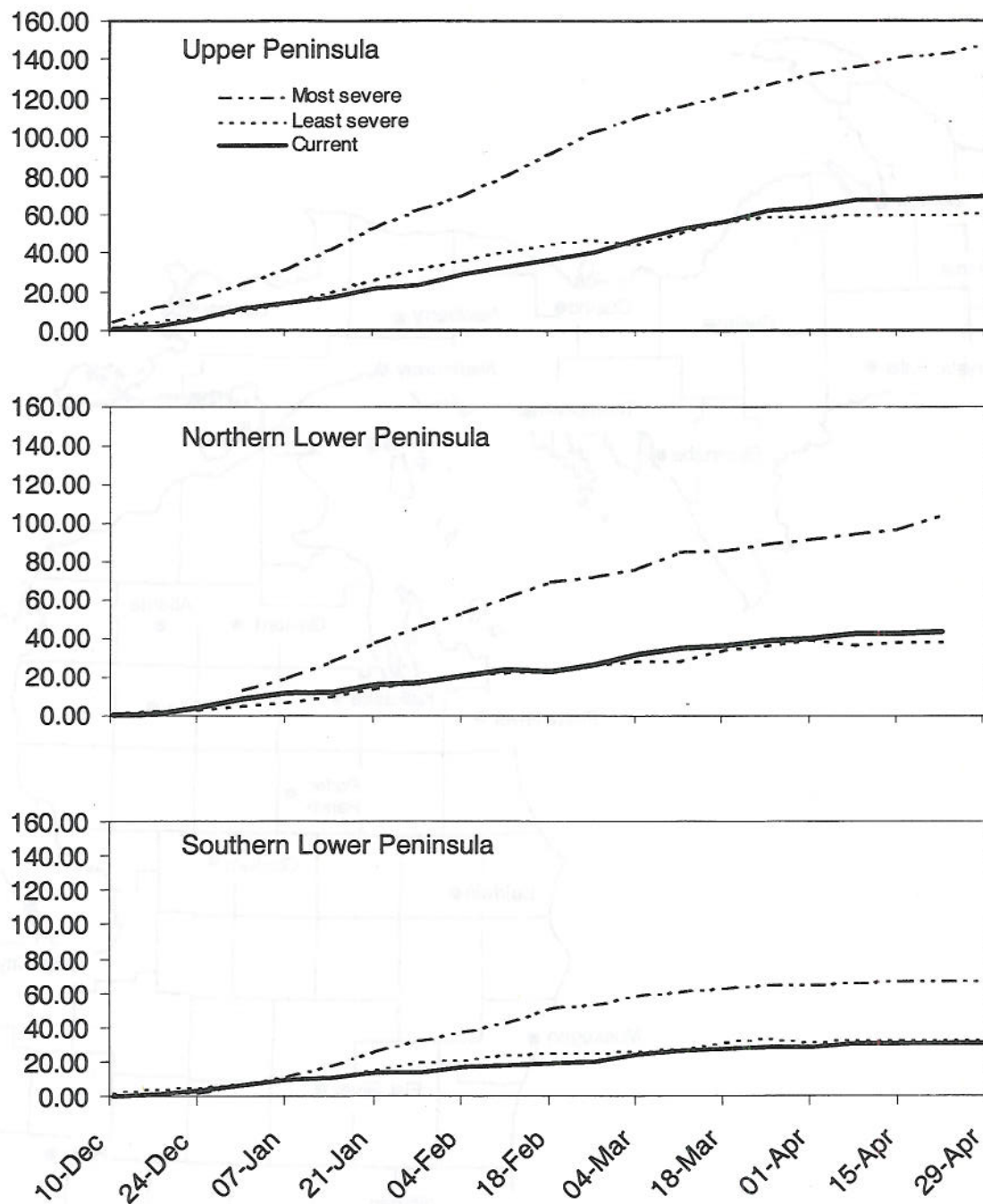


Figure 2. Comparison between most severe, least severe, and current winter severity index for each region of Michigan.

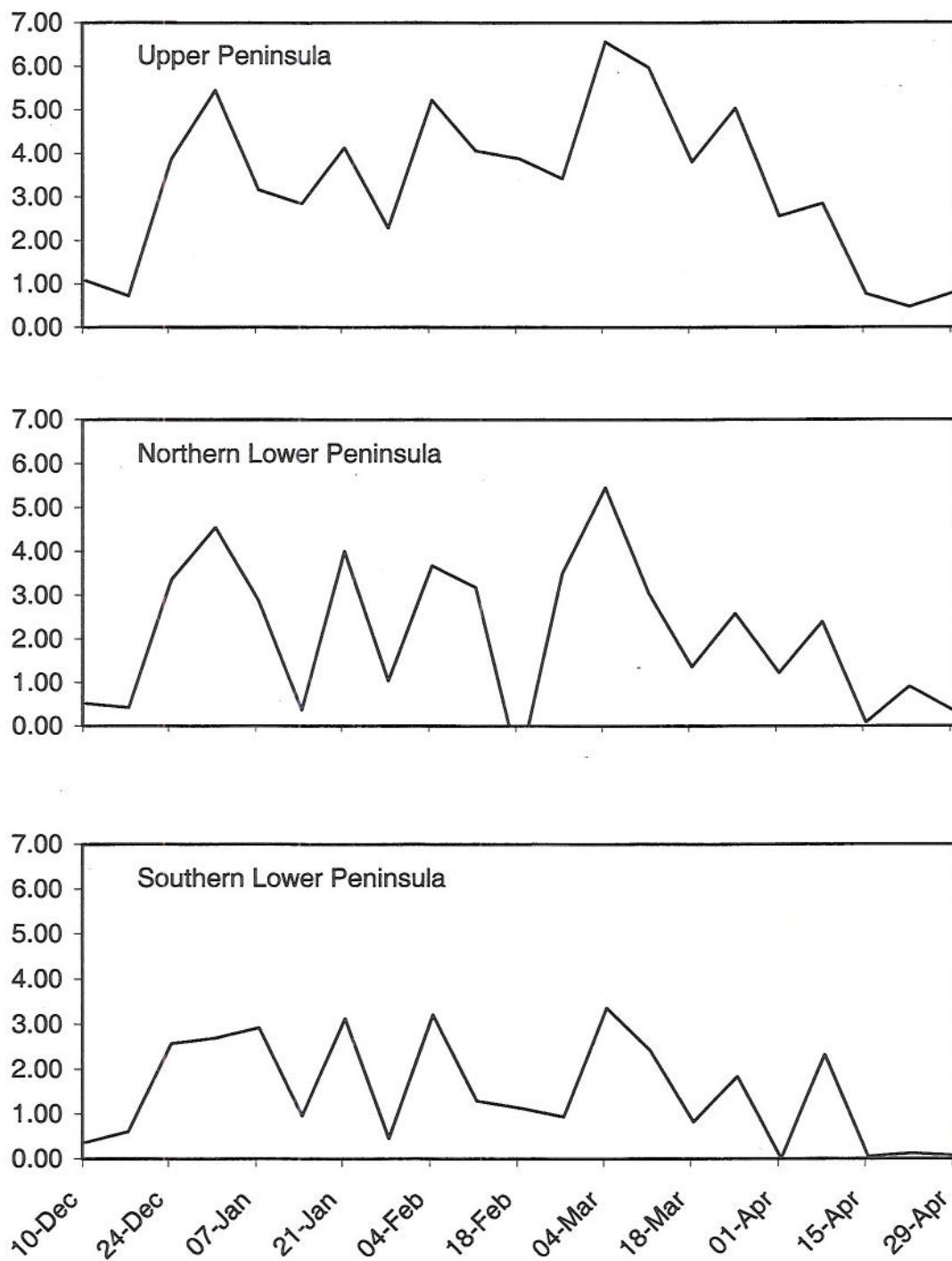


Figure 3. Regional weekly average severity readings, December 2001 - April 2002.

