Wildl. Soc. Bull. 16:269–272, 1988

RELATIONSHIP BETWEEN WINTER SEVERITY AND WOLF DEPREDATIONS ON DOMESTIC ANIMALS IN MINNESOTA

L. DAVID MECH,[1] *U.S. Fish and Wildlife Service, Patuxent Wildlife Research Center, Laurel, MD 20708*

STEVEN H. FRITTS, *U.S. Fish and Wildlife Service, Patuxent Wildlife Research Center, Laurel, MD 20708*

WILLIAM J. PAUL,[2] *U.S. Fish and Wildlife Service, Patuxent Wildlife Research Center, Laurel, MD 20708*

Wolves (*Canis lupus*) prey on domestic animals in Minnesota primarily from May through October, and the extent of depredation varies considerably from year to year (Fritts 1982). However, no reason for this variation has yet been apparent.

White-tailed deer (*Odocoileus virginianus*) fawns are the primary summer prey of wolves in Minnesota (Frenzel 1974, Van Ballenberghe et al. 1975, Fritts and Mech 1981, Nelson and Mech 1986). Vulnerability of fawns is at least partly a direct function of the previous winter's

[1] Mailing address: North Central Forest Experiment Station, 1992 Folwell Avenue, St. Paul, MN 55108.

[2] Mailing address: North Central Experiment Station, University of Minnesota, 1861 East Highway 169, Grand Rapids, MN 55744.

Table 1. Number of confirmed complaints of wolf depredations on domestic animals in Minnesota and relationships with severity of previous winters, 1979–1986.

Year	WSI[a]	Jan–Apr	May	Jun	Jul	Aug	Sep	Oct–Dec	Total
1979	147	0	5	2	1	4	2	2	16
1980	124	1	5	5	4	8	1	4	28
1981	91	4	5	6	13	14	12	6	60
1982	132	1	5	3	6	7	7	5	34
1983	89	6	7	9	5	5	6	2	40
1984	118	0	6	7	8	9	2	3	35
1985	108	5	2	5	11	5	5	6	39
1986	140	3	5	3	2	8	5	4	30
	r	−0.74	−0.14	−0.86	−0.72	−0.36	−0.56	−0.24	−0.84
	P	0.02	0.76	0.01	0.04	0.38	0.14	0.56	0.01

[a] Mean of winter severity index (WSI) at International Falls and Agassiz National Wildlife Refuge (Fig. 1).

0.01) for the 9 variables tested. The strongest relationship was for total confirmed complaints of wolf depredations on domestic animals (Table 1), 93% of which were livestock; other losses involved pets. The *r*-values for periods throughout the year supported both of our explanations. For January–April the strongest inverse relationship (Table 1) could have resulted from the known dependence between last snow melt and the release of livestock onto open range. After May, *r*-values are consistent with the explanation that wolves kill domestic animals inversely to the availability or vulnerability of deer fawns. The lack of a significant relationship in May also is consistent with both explanations because livestock are always on open range in May regardless of winter severity, and deer fawns are not born until late May and early June.

Further evidence for the fawn-vulnerability explanation was found in the decreasing *r*-values after June (Table 1), because deer fawns are most vulnerable immediately after birth in late May and June. Thus the influence of the previous winter's severity would become increasingly diluted as each month passes, and the degree of the relationship would dwindle.

We recognize that our analyses do not confirm cause and effect. Conceivably some other factor, related or unrelated to vulnerability of deer fawns, could be the actual cause of the relationship. Regardless of the explanation, the relationship we have found allows agencies responsible for the control of wolf depredation to anticipate the relative magnitude of wolf depredations in a given year and plan their programs and personnel accordingly.

Acknowledgments.—This study was supported by the U.S. Fish and Wildlife Service. We thank R. M. McRoberts for statistical advice, P. D. Karns of the Minnesota Department of Natural Resources for use of the winter severity index, and the Department of Agriculture (APHIS) for use of the 1986 data.

LITERATURE CITED

BERG, W. E., AND D. W. KUEHN. 1982. Ecology of wolves in north-central Minnesota. Pages 4–11 *in* F. H. Harrington and P. C. Paquet, eds. Wolves of the world. Noyes Publ., Park Ridge, N.J.

FRENZEL, L. D. 1974. Occurrence of moose in food of wolves as revealed by scat analysis: a review of North American studies. Nat. Can. 101:467–479.

FRITTS, S. H. 1982. Wolf depredation on livestock in Minnesota. U.S. Fish and Wildl. Serv. Resour. Publ. 145. 11pp.

———, AND L. D. MECH. 1981. Dynamics, movements, and feeding ecology of a newly protected wolf population in northwestern Minnesota. Wildl. Monogr. 80. 79pp.

MECH, L. D., AND P. D. KARNS. 1977. Role of the wolf in a deer decline in the Superior National Forest. U.S. For. Serv. Res. Pap. NC-148. 23pp.

———, R. E. MCROBERTS, R. O. PETERSON, AND R. E. PAGE. 1987. Relationship of deer and moose population to previous winters' snow. J. Anim. Ecol. 56:615–627.

NELSON, M. E., AND L. D. MECH. 1986. Mortality of

white-tailed deer in northeastern Minnesota. J. Wildl. Manage. 50:691–698.

VAN BALLENBERGHE, V., A. W. ERICKSON, AND D. BYMAN. 1975. Ecology of the timber wolf in northeastern Minnesota. Wildl. Monogr. 43. 43pp.

VERME, L. J. 1962. Mortality of white-tailed deer fawns in relation to nutrition. Proc. Natl. White-tailed Deer Dis. Symp. 1:15–38.

———. 1968. An index of winter severity for northern deer. J. Wildl. Manage. 32:566–574.

Received 22 January 1987.
Accepted 26 April 1988.