

REGIONAL COPPER-NICKEL STUDY
BLACK BEAR (Ursus americanus)

Minnesota Environmental Quality Board
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Abstract

The status of the black bear in Minnesota has varied from being an unprotected animal, a bounty paid for its removal, and the present status of a game animal. Currently (1971-1977) an average of 292 bears are harvest in the state each year during the special bear season and an additional 50-200 are taken during the deer season. About 9 percent of the 1977 total harvest of 702 bears were taken within the boundaries of the Regional Copper-Nickel Study Area (Study Area).

The principal range of the black bear in Minnesota is the forested region in the northcentral/northeastern portion of the state. Most of the Study Area is in that portion of the Arrowhead Region which has long been considered important bear habitat. In all, 8.3 percent of the state's bear range is located within the boundaries of the Study Area.

Upland habitats which provide ample supplies of bear food are preferred cover types. These include largely upland clearcuts and young seral stages, combined with conifer plantations containing a diversity of shrubs and trees that produce fruits or nuts. Winter denning sites are varied and may occur on either upland or lowland sites.

Favorite bear foods include fruits from mountain ash and blueberries combined with hazelnuts. Acorns are used heavily when available, with ants and wasps providing a reliable source of fat and protein. Nearly every bear also utilizes food from human dumps during some portion of the year. This behavior, along with attempts to obtain food stored in homes and cabins during periods of shortage, has increased mortality rates. Bear populations are currently limited by: a scarcity of natural foods causing malnutrition and death among largely cubs and yearlings; combined with shooting of nuisance animals.

Black bear densities in northeastern Minnesota range from 1.6/10km² during low populations to 2.4/10km² during highs. The long term average probably represents a loss of 2 bears for each 10km² of land lost to mining in this region.

INTRODUCTION TO THE REGIONAL COPPER-NICKEL STUDY

The Regional Copper-Nickel Environmental Impact Study is a comprehensive examination of the potential cumulative environmental, social, and economic impacts of copper-nickel mineral development in northeastern Minnesota. This study is being conducted for the Minnesota Legislature and state Executive Branch agencies, under the direction of the Minnesota Environmental Quality Board (MEQB) and with the funding, review, and concurrence of the Legislative Commission on Minnesota Resources.

A region along the surface contact of the Duluth Complex in St. Louis and Lake counties in northeastern Minnesota contains a major domestic resource of copper-nickel sulfide mineralization. This region has been explored by several mineral resource development companies for more than twenty years, and recently two firms, AMAX and International Nickel Company, have considered commercial operations. These exploration and mine planning activities indicate the potential establishment of a new mining and processing industry in Minnesota. In addition, these activities indicate the need for a comprehensive environmental, social, and economic analysis by the state in order to consider the cumulative regional implications of this new industry and to provide adequate information for future state policy review and development. In January, 1976, the MEQB organized and initiated the Regional Copper-Nickel Study.

The major objectives of the Regional Copper-Nickel Study are: 1) to characterize the region in its pre-copper-nickel development state; 2) to identify and describe the probable technologies which may be used to exploit the mineral resource and to convert it into salable commodities; 3) to identify and assess the impacts of primary copper-nickel development and secondary regional growth; 4) to conceptualize alternative degrees of regional copper-nickel development; and 5) to assess the cumulative environmental, social, and economic impacts of such hypothetical developments. The Regional Study is a scientific information gathering and analysis effort and will not present subjective social judgements on whether, where, when, or how copper-nickel development should or should not proceed. In addition, the Study will not make or propose state policy pertaining to copper-nickel development.

The Minnesota Environmental Quality Board is a state agency responsible for the implementation of the Minnesota Environmental Policy Act and promotes cooperation between state agencies on environmental matters. The Regional Copper-Nickel Study is an ad hoc effort of the MEQB and future regulatory and site specific environmental impact studies will most likely be the responsibility of the Minnesota Department of Natural Resources and the Minnesota Pollution Control Agency.

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Introduction

Man's concept of the importance of the black bear in Minnesota as reflected by game laws has changed dramatically over the past 60 years. This species has been protected (1917, 1923, 1931), unprotected (prior to 1917, 1919, 1925), a bounty paid for its removal (1945-1965) and established as a big game animal (1933, 1971; Longley and Knudson, 1974). The big game status has remained in effect since 1971 and is likely to persist.

Distribution and Importance of Species

The bear harvest in Minnesota has ranged from highs of 861 (fiscal year 1945-46) and 851 (1949-50), to a low of 2 animals (1960-61, 1961-62; Longley and Knudson, 1974). From 1965-1970 an average of 108 bears (range 59-190) have been taken during the deer season. With controlled harvest after the reestablishment of bear as a big game animal in 1971 and establishment of a special season in September and October, state harvests have been increased. An average of 292 bears have been taken during this special season from 1971-77, with an additional 53-188 taken during the deer season (Longley and Knudson, 1974; Longley, MDNR, pers. comm.). In 1977, 702 bear were taken (514 special season plus 186 deer season), the largest harvest of any year since 1971.

The principal range of black bears in Minnesota is the forested region in the northcentral and northeastern portion of the state. All counties including and lying north and/or east of a line from Chisago-Becker-Lake of the Woods have reported bears taken during the 1977 season. The eastern portion of the Arrowhead Region (all of Cook, most of Lake, and the northern one-third of St. Louis County) has long been considered important bear habitat. Early protection was granted to bears in this area in the late bounty period (1962-63) as the state

population was declining (Idstrom, 1963).

An estimate of the importance of the Regional Copper-Nickel Study Area (Study Area) as black bear habitat was calculated from 1977 harvest data. Forest coverage (all types combined) within the 19 counties where harvests were recorded (Rutske 1978a, 1978b) totaled 55503 km². This agrees closely with the range estimates and map provided earlier for bear by Idstrom (1963). Since all of St. Louis and Lake counties lie within the bear range, the forested area within these two counties (12893 and 4423 km², respectively) represent 23.2 and 8.0 percent of the bear habitat in the state. Combined, these counties represent nearly one-third of the range. The Study Area contains 8.3 percent (4638 km²/55503 km²) of the state's habitat and 26.8 percent (4638 km²/17316 km²) of that available in the two county area.

Based on reported 1977 harvest (Rutske 1978a, 1978b), St. Louis County was second (n = 125) only to Itasca County (n = 135) in the number of bear taken. Lake County ranked sixth (n = 50). These figures do not consider habitat differences between counties and a currently unknown statistic, hunter effort. The 1977 figures, corrected for the area of forest per county, represent a harvest of 0.97 bears/100 km² for St. Louis and 1.12 bears/100 km² for Lake. These are considerably below those from six other top harvest counties (range from 1.54 to 3.00). These data probably reflect reduced hunter densities in northeastern Minnesota due to the limited road access rather than a low regional bear population.

The estimated bear harvest within the Study Area for 1977 was calculated from "kill block" data (Rutske 1978a, 1978b). The Study Area includes

portion of 12 registration zones (Table 1). Assuming an evenly distributed kill within each block and calculating the proportion of each block lying within the Study Area, we estimated that 64 bears were shot within the boundaries of this area. This represents 37 percent (64/175) of the take in St. Louis-Lake counties and 9 percent (64/702) of the state total. Both of these figures represent substantial proportions of the current harvest in the northeast and state as a whole.

A six year black bear field study, conducted from 1969-75, was centered just east of the Study Area at Isabella, Minnesota (Rogers, 1977).

Rogers (USFS, pers. comm.) suggests that similarities between his study area and this one allow application of his density estimates directly to the Study Area, although such expansion may result in considerable error. With these limitations in mind, the bear population in the Study Area has been estimated using both the high population density of 1974 (1 bear/4.1 km²) and the lowest density (1 bear/6.3 km²) from 1977 (Rogers, pers. comm.). The current low density of bear in northeastern Minnesota is believed linked to reduced food supplies existing since 1974. Based on the above densities the Study Area may currently provide habitat for 825 bear, with a potential population during favorable years of 1268. State population estimates are not currently available to compare with these figures (Rutske, MDNR, pers. comm.).

Habitat Requirements

Detailed habitat use for black bear in northeastern Minnesota has not yet been compiled (Rogers, USFS, pers. comm.), but preliminary analysis suggests that closed canopied black spruce swamps and bog types provide limited food resources for bear and are probably of marginal value to this species. This agrees with findings by Jonkel and Cowan (1971) in

a largely mature spruce-fir forest in Montana. However, these same conifer dominated areas can maintain a high density black bear population if the remaining land has a rich habitat diversity including clearcuts, meadows, creek bottoms, roadways and early serial stages.

The location of winter den sites are also so varied that no cover type (upland or lowland, forested or clearcut) appears to be preferred or avoided (Rogers, USFS, pers. comm.). With the present demand for long fibered pulp made largely from jack pine and black spruce, extensive areas of closed canopied, mature coniferous cover are not likely to develop, with young forest types generally providing more favorable bear habitat.

Food Requirements

Upland habitats which produce ample supplies of bear food are preferred cover types. Erickson and Petriker (1964) included upland hardwood and mixed deciduous-coniferous stands as preferred in fall in Michigan, with conifer swamps used for winter denning. Rogers (1977) found that upland clearcuts and early serial stages are preferred types for their food production in Minnesota. Lauckaart (1956) also noted the importance of these early serial stages for rapid population increases, with food shortages a major problem for bears in maturing habitats. Locally, the most important bear foods are mountain ash (Sorbus americana), blueberries (Vaccinium spp.) and hazelnuts (Corylus spp.) (Rogers, USFS, pers. comm.). Oaks (Quercus spp.) are uncommon in northeastern Minnesota, but bears have been known to travel 35 km to feed on acorns in fall (Rogers 1977). Rogers also found that "ants and vespid wasps were the most reliable source of fat and protein for bears in the study area."

In addition to these natural foods, almost every bear used human dumps to some degree, during some portion of the year (Rogers 1977). Males

used dumps extensively in fall, while females used this food source primarily in spring and relied largely on natural food in the fall. Females with limited or no access to dumps generally produced their first litter at an older age than those using dumps extensively, and some never reproduced (Rogers, 1977).

Sources of Mortality

The annual sources of mortality for 41 bears from Rogers' (1977) study were as follows: 16 (39 percent) natural causes, most believed to be related to malnutrition; 23 (56 percent) gunshots; 1 (2 percent) car kill; and 1 (2 percent) steel traps. Fifteen of the 16 natural deaths were cubs and yearlings, while 61 percent of the bears that were shot (14/23) were killed as nuisance animals outside of the hunting season. The author considered scarce food and shooting (mostly non-hunting related) as directly limiting bear numbers on his study area.

Impact

The most apparent and direct impact on the black bears living in the Study Area will be the direct loss of land to mining operations. Extensive land use changes would be necessary to appreciably change the local population. Because of the generally low density of this animal, estimates are that for every 10 square km of habitat (clearcut, shrub or forest cover) eliminated or altered in such a way that it could be considered unfavorable for black bear, the regional population will be decreased by 1.6 bears during a low population and 2.4 during high densities. The long term average probably represents a loss of 2 bears for each 10 square km of land lost to mining in northeastern Minnesota. A more subtle impact, and in the long term perhaps the most important one, is related to the pattern of human settlement. The addition of

large urban land fills and/or small dumps associated with individual residence will increase the food supply for bears, especially during years of scarce natural foods. This benefit to local bear populations has been masked, however, by increased confrontation with humans. Locally, the shooting of nuisance bears is already nearly equal to deaths due to natural causes (Rogers 1977). This source of mortality may become even more prevalent in the future with expected increases in the density and distribution of human settlement. If shooting of nuisance bears does increase, the bear's low reproductive rate will not be adequate to maintain current densities, and local populations will decline.

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Table 1. Estimated black bear harvest on the RCNSA for
the 1977 season.^A

Kill block No. B	Total bears harvested from kill Block _A	X	Proportion(%) of kill block within RCNSA C	=	Number of Bears harvested within RCNSA D
30	7		52		3.6
31	27		74		20.0
33	3		22		0.7
35	11		11		1.2
41	9		19		1.7
42	11		21		2.3
43	2		8		0.2
44	28		87		24.4
45	9		56		5.0
46	4		89		3.6
47	15		3		0.4
48	4		18		0.7
Total	130				63.8

A. Data provided by LeRoy Rutske, MDNR, St. Paul, Minnesota.

B. Registration zones established by the MDNR to maintain harvest data.

C. Calculated by using a pattern of grid dots over a map with the kill blocks and RCNSA boundaries drawn in.

D. Estimated harvest assuming uniform harvest over entire kill block.