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Nickel mining and the BWCA: A question of priorities

WALTER E. PARHAM *

ABSTRACT — A conflict in potential land use of the Boundary Waters Canoe Area (BWCA) exists between those who wish to see the area open to mining and those who want it retained as a natural wilderness. A review of information available to the public which relates to possible nickel mining within the BWCA suggests that the BWCA itself in its natural state is a more valuable resource to the people of the United States than it is as a source for nickel. The high U.S. rate of consumption of nickel, our use of nickel in products in which it is non-essential, and the low nickel content of the rocks in the BWCA point to nickel mining in the BWCA as only a short-term, stopgap effort to maintain a steady supply of this metal for U.S. needs.

NOTE: Since this paper was presented in the spring of 1972, a United States District Court ordered that holders of leases to mineral rights within the Boundary Waters Canoe Area be permanently enjoined from direct or indirect mineral exploration there. In addition, the order issued January 4, 1973, prohibits any assistance by the U.S. Department of Agriculture, the National For-

est Service or state officials in any attempt to exploit the minerals. In the decision, Judge Philip Neville said, "There can be no question but that full mineral development and mining will destroy and negate the wilderness or most of it [BWCA]." He added that mining cannot take place in a wilderness area "else it no longer is a wilderness area." It is expected the decision will be appealed.

The question under debate is whether the Boundary Waters Canoe Area (BWCA) in northern Minnesota can endure in its natural wilderness state or whether the rocks of the BWCA will be mined for the nickel and copper they contain. The citizen who reads one day about the need for retaining such natural areas for our present and future enjoyment, and on the following day reads about the need for mining that area may find it difficult to make a clear choice. Yet, such decisions are being made, and some of us feel unsure of the needs we value most. Will our decision emphasize short- or long-term gains? If we should make a poor choice now, how can adverse effects arising from our choice be remedied later?

Minnesota has long been famous as an iron-mining state. Now, there is a possibility of the development of a copper-nickel mining industry in northern Minnesota. The BWCA constitutes a part of this potential mining area. P. K. Sims (1970b), Director of the Minnesota Geological Survey, has pointed out that "... the past decade has been one of a newly emerging mineral industry in the state, and the Minnesota Geological Survey has given high priority to efforts to stimulate this industry, because it can, and will, have a tremendous impact on the state's economy." He estimates that "... it is probable that some of the deposits will be mined within a few years, and I predict that the area will be a major

mining region by the 1980's — unless unreasonable restrictions are imposed on the mining and processing of the ores" (Sims, 1970a).

The BWCA of Minnesota, situated along the Canadian border, is a scenic area of pine forests and interconnected clear lakes. In addition, it is a national scientific resource.

"The BWCA is absolutely unique in this country. It contains the only large region of virgin forest east of the Rocky Mountains — 40 per cent of the one million acres has never been cut. The area of mining interest transects the heart of the uncut portion." "... it is all that is left of a vast natural conifer forest extending from northwestern Minnesota to the coast of Maine" (Wright, Jr., 1970). The region is suited for camping and canoeing, and is accessible to a large population for vacationing. Within the BWCA boundaries, travel by car and aircraft is prohibited, so its wilderness character has been preserved. The number of visitors to the BWCA has almost doubled since 1966 (USDA, 1971), and the increased use of the area by vacationers has reached a point where some camp sites have developed signs of excessive wear and have been retired and repaired while new ones were opened. If the BWCA's wilderness state is to be maintained, the possibility of restricting the number of persons using the BWCA each year may become a reality (Lucas, 1964).

But what about opening the BWCA for copper-nickel mining? How badly do we need these mineral resources? Is there a possibility that we will, in fact, exhaust our copper and nickel resources in the United States in the foreseeable future? What measures could we take in the

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event of an imminent shortage of nickel? Let's look at these questions further.

Geology and Mineral Potential of BWCA

Exploration for copper and nickel sulfides has centered on rocks of the Duluth Gabbro complex, a large body of basic igneous rocks that crops out in an arcuate pattern on the highland northwest of Lake Superior (figure 1). The sulfide minerals are widely dispersed in the basal part of the gabbro and locally extend upward from the base a few hundred feet (Sims, 1968). About 40 miles, or 25 per cent, of the basal contact of the gabbro lies within the BWCA.

"So far as we know, potentially valuable concentrations of copper and nickel minerals occur only along and near the base of the Gabbro — which is the eastern or northern boundary of the rock body" (Sims, 1970a). "Exploration along the base of the Duluth Gabbro has indicated the presence of very large quantities of the metals copper and nickel, but only locally are the metallic minerals concentrated sufficiently to constitute potentially commercial ore deposits. The best deposits that have been found to date — insofar as I know — are marginal at today's market conditions" (Sims, 1970a).

Analyses of some copper-nickel bearing rocks from along the base of the gabbro show contents of as much as 1.2 per cent combined copper-nickel in the ratio of about 3 or 4 to 1, however, it is more common to find large quantities of lower grade material containing 0.3 to 0.6 per cent combined copper and nickel (Sims, 1968; Joyce, Jr., 1971).

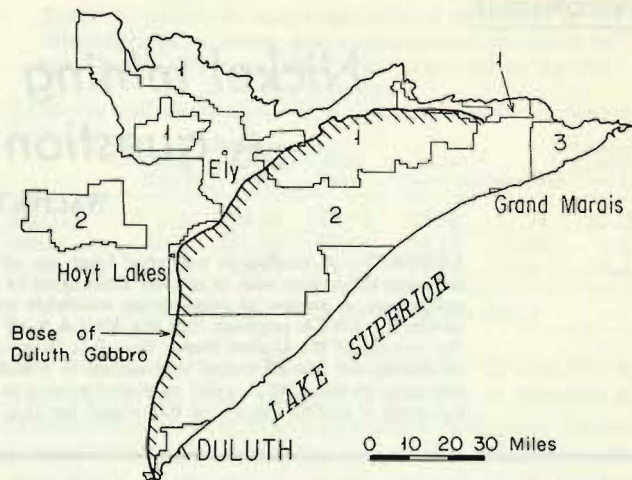
Of the two metals present in the rocks of the BWCA, the one with the smallest U. S. reserves is nickel. The U. S., at present the world's leading copper producer, imported about 15 per cent of its copper in 1969. The situation is different with respect to nickel, where, in 1969 the U. S. imported about 80 per cent of its supply (Min. Yearbook, 1971). A major factor for mining companies most likely will be the quantity of nickel that can be extracted economically from Minnesota's rocks (Sims, 1968).

Since the lack of U. S. primary reserves of nickel rather than copper will jeopardize the security of the BWCA, the following discussion focuses primarily on the potential mining of nickel within the BWCA.

Nickel Sources and Uses

The United States is the world's largest user of nickel (Min. Yearbook, 1971), and U. S. production plus imports amount to 27.6 per cent of the world's total, of which only 3.2 per cent was mined in the U. S. Canada supplied 87 per cent of our imported nickel, and Norway 9 per cent.

Nickel's major uses are in alloys and plating. De-Longe (1970) estimated the 1969 Free World consumption of primary nickel as 820 million pounds. Stainless steels required 39 per cent, high nickel alloys 16 per cent, nickel plating 14 per cent, construction alloy steels 11 per cent, iron and steel castings 9 per cent, copper and brass products 3 per cent, and all other uses 8 per cent.



- 1 Boundary Waters Canoe Area
- 2 Superior National Forest
- 3 Grand Portage State Forest

FIGURE 1. The Duluth Gabbro is situated primarily within the Superior National Forest and partially in the Boundary Waters Canoe Area of northern Minnesota. Shaded line represents the western and northern basal contacts of the gabbro (after Sims, 1968).

World consumption of nickel increased at a rate of 15 per cent compounded between 1963 and 1966, while the annual growth rate was only 4.1 per cent in the preceding seven years (DeLonge, 1970). The world usage rate for nickel, as well as most other resources, is growing exponentially and it is estimated that the present known world reserves of nickel will be exhausted in 54 years (Meadows, et al., 1972). Further calculations by Meadows et al (1972), which assume the nickel reserves yet undiscovered could increase present known reserves by a factor of five, show that such an increase would only extend the lifetime of the reserves from 54 to 96 years. The U. S. demand for nickel has been forecast to range between 895 and 1,295 million pounds by the year 2000. The high forecast would be almost 3.5 times the quantity of nickel consumed in 1968 (Reno, 1970).

The U. S. Bureau of Mines published two reports on nickel in 1970. The first report contained calculations on the potential availability of U. S. primary nickel resources. "The report is based on the premise that the question is asked, 'if it were necessary to obtain all of the domestic nickel potentially available, at what prices could it be gotten at today's cost?'" (Kingston et al, 1970). They estimated that 4,268 million pounds of recoverable nickel would be available in the U. S. assuming a sixfold increase in price, i.e., from about \$1.00 to about \$6.00 per pound. They concluded that compared with 1968 U.S. nickel consumption of 320 million pounds at an approximate quoted \$1.00 per pound, the total available resources at a price of about \$6.00 per pound would meet the demand for 13 years; at about \$3.00 per pound the supply would last 7.5 years; and at about \$2.00 per pound it would last 3 years. Their estimated percentage of available nickel for Puerto Rico is

41.7 per cent, Oregon 20.4 per cent, Montana 10.9 per cent, Minnesota 8.8 per cent, California 8.6 per cent, Washington 6.6 per cent, Alaska 1.9 per cent, and Colorado, North Carolina, Maine, and Pennsylvania comprise the remaining 1.1 per cent.

The second U. S. Bureau of Mines report (Reno, 1970) states that the relative price of nickel is not expected to increase significantly by the year 2000. Moreover, the report says that "A price increase which would bring marginal domestic deposits into production seems unlikely, so after 1985 the United States will have to depend on foreign deposits for its primary nickel. Therefore, the world situation must be assessed to evaluate the supply-demand balance." Further, "Nickel resources are known in Puerto Rico and in the Duluth Gabbro of Minnesota, but conflict of land usage in Puerto Rico and the apparent low grades of material in the Duluth Gabbro make it highly unlikely that either deposit will be considered for nickel supply to the United States in the 20th century."

Further consideration must be given here to the question of whether the U. S. could become self-sufficient in regard to nickel resources; first, as to the circumstances under which such a situation might develop, and secondly, as to how long supplies would last in this event.

The U.S. Bureau of Mines report (Reno, 1970) points out that "at the present rate of production, the known economic nickel resources of the United States other than as a byproduct will be exhausted by 1985." Clearly the U.S. consumption is so great that all potentially available nickel deposits known in this country can provide no more than a short-term stop gap supply. Recalling that Minnesota's share of the total U.S. potentially available nickel amounts to only 8.8 per cent, and assuming that mineralization is distributed equally along the base of the Gabbro, then the BWCA's contribution makes up only about one-quarter of that figure or 2.2. per cent. Should we be forced to become self-sufficient in nickel production, the BWCA's estimated contribution would last about four months at the present rate of consumption.

Future Nickel Sources

Where will we obtain nickel if the Canadian deposits are exhausted or if we lose access to them? K. A. De-Longe of the International Nickel Company said in 1970 that "to date in the world, 80 per cent of nickel production has come from sulfide ores and 20 per cent from lateritic or oxide ores. Of the known ore reserves in the world, the ratio is the other way around — 80 per cent lateritic and 20 per cent sulfide. From this it can be seen that the future major expansion in the world's nickel supply can be expected to come largely from the laterites which are located as surface or subsurface deposits in many areas in the tropics and subtropics." Later that year H. S. Wingate, also of International Nickel, stated that ". . . there are massive deposits of lateritic ore in many parts of the world running approximately 1.5 per cent nickel, and some of those that are in operation running somewhat above that."

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If we are to continue in the future to use nickel at our present rate, we will have to maintain and develop trade with those countries where the bulk of potentially available nickel is present, i.e., many of the underdeveloped countries. Our national defense may then depend mainly on our efforts in developing and maintaining friendly foreign relations.

The attitude of "Be reasonable. Do it my way," still prevails in some U.S. thinking regarding how other countries should behave while making their natural resources available to us. C. F. Park, Jr. (1968) in his book *Affluence in Jeopardy*, says "the more highly developed and industrialized countries today encourage imports because they need more raw materials than they are able to produce . . . Any attempt to deprive these countries of the mineral supplies they need could foment international trouble." Further, in his discussion of what the United States mineral policy should be, he states, "the United States, in the shrinking world of the future, will find increasing difficulties in continuing to prosper while our neighbors to the south, upon whom we depend for so much, continue in a state of poverty and hunger and limited education. Latin America needs opportunity to develop industries; it needs funds for education and for expansion of its markets. Assistance that would enable Latin America to develop its industries, its educational system, and its trade does not require massive government aid or the everlasting 'temporary' expedient of free food. It should lie in cooperation. Cooperation would mean, of course, that the nations of Latin America would treat United States investors with consideration—there could be no expropriation or overtaxation of mineral resources developed by private capital from this country." Can we expect to develop an atmosphere of long-lasting, mutual cooperation between the United States and developing countries based on such a national mineral policy?

Environmental Considerations

The U.S. Bureau of Mines' publication, *Mineral Facts and Problems*, contains a 13-page paper on nickel (Reno, 1970). Quoted in its entirety, the section entitled "Environmental Considerations" reads: "The one nickel mine in the United States is in a sparsely populated area where air and water pollution are not major problems. Open pit mining will leave a scar on the terrain, but it will be shallow and is expected to heal in time."

If large-scale mining operations were carried out in the BWCA, another sparsely populated area, what would remain of the natural area after the deposits ran out? What would be the effect on the surrounding landscape and water of tailings piles, plant and mine sites, haulage roads, new housing settlements, satellite industries and businesses, and possible smelting operations? If copper-nickel mining were limited only to nearby areas outside of the BWCA, what would be associated effects on the BWCA of these new land uses?

Emissions of sulfur dioxide from smelting operations in other mining areas have killed pine trees as far as 40 miles away (Hepting, 1964). Technological improve-

ments have been made, meanwhile, in sulfur dioxide removal from stack gases. A pilot-scale wet limestone-dolomite process has been developed that can remove more than 95 per cent of sulfur dioxide from the stack gases (A.C.S., 1969). However, the outlook does not seem so bright from other perspectives. As recently as April, 1970, H. S. Wingate stated that at International Nickel Company's Sudbury, Ontario operations only about 26 per cent of the sulfur dioxide is removed from stack gases and about 40 per cent removal is expected in the future with better equipment. In addition, he said, the height of the stack at Sudbury is being increased considerably to "carry the sulfur dioxide in the air over great distances," and "widely disperse it, so that whenever the fallout does take place, it will fall out in such minute particles as to be completely harmless." The success so promised has been subject to debate. "But what promises to be helpful for one city concerns another 79 miles away. People in North Bay, for example, wonder whether the high winds which hopefully will carry the air pollution away from Sudbury may not deposit the pollution on their town. There are no ready assurances that it will not" (St. Paul Pioneer Press, 1970).

The U.S. Bureau of Mines assumed that nickel-sulfide smelters for the gabbro material would be situated in Ely, Minnesota, (Kingston et al, 1970), adjacent to the BWCA and the starting point for canoe and vacationing activities.

Conservation, Substitutes and Non-essential Uses

Many conservationists feel that unique natural areas, such as the BWCA, are disappearing rapidly from our country and an effort should be made now to protect them from destruction. Others see conservation in a different light. Park (1968) states that "Almost everyone is in favor of conservation, but not everyone means the same thing by the term. As used here, it means the maximum use and the minimum waste of a commodity and of the earth's surface." He states further that "Our definition of conservation applied to land indicates multiple use. Does true conservation mean the setting aside of large areas of public lands, not using their minerals but maintaining the land in semi-idle condition solely for recreation and posterity? May not holding 'for posterity' mean waste when there is a need to use the minerals in the land? Are preservationists truly conservationists?" Considering present rate of consumption of nickel, does the short-term supply of low-grade ore in the BWCA require mining it because it is there?

Are there substitutes for nickel? Reno (1970) says that alternate materials are available in essentially all uses; and DeLonge (1970) says some substitution already has occurred. In addition, Park (1968) states that "Substitutes are available for almost all uses of nickel, but the prevailing low price, ready availability, and pleasing appearance of its nickel alloys, combined with extensive product research and excellent public sales relations, have made nickel . . . of considerable importance in international trade."

There is another way in which nickel could be con-

served other than by substitution. Familiar, everyday items frequently contain nickel for little or no meaningful purpose. What is expected of a new automobile? It is likely that prospective buyers visualize a car with abundant "chrome" trim, which really involves considerable nickel plating. Nickel plating has been used to denote value.

Words like "brilliance," "value," "badge of quality," "prestige," and "durability" are emphasized heavily in advertising, but is nickel plating of automobile bumpers and other trim an intelligent use of a limited resource? Is our goal to exhaust our non-renewable resource as fast as possible? Optimistically, International Nickel's president A. P. Gagnebin (1967) stated that "We know, from past experience, that there will be the day when there will be an excess supply of nickel and that we must have new developments and new products at that time to absorb the additional production." On the other hand, if our available supply of nickel should run short, Mr. Gagnebin (1967) has a further suggestion: "And, of course, finally, it is easy to make the nickel plating a little bit thinner."

A Matter of Choices

The United States is a nickel-poor nation. The BWCA, which is a unique wilderness area used by increasingly large numbers of persons for recreation and pleasure, contains an estimated 2.2 per cent of our primary nickel resources, and these deposits are of low grade. In order to make mining of all the estimated nickel reserves of the BWCA practical, the price of nickel would have to triple. Assuming first that such a price increase would take place, and assuming further that the United States should have to become self-sufficient with regard to mining nickel, the BWCA's resources would last about four months at our present rate of consumption.

The question of mining and the BWCA is complex. Taking an extreme position on either side may make for an easy answer, but, in fact, only obscures the real issues. Opening or closing the BWCA to mining actually requires a whole series of decisions. For example,

- a. Should this nation continue to use nickel as in the past?
- b. Are more common substitute metals acceptable for non-essential uses of nickel?
- c. How will the need for scarce materials like nickel affect foreign policy, and vice versa?
- d. Are natural areas like the BWCA as valuable a fundamental resource of this country as mineral wealth?

(The problem of private ownership of mineral rights within the BWCA has received considerable public attention and examination elsewhere and is not discussed here).

Predicting potential hazards or future problems, such as in the case of mining and the BWCA, of course, is subject to controversy. However, "The early-warning approach requires that scientists call the shots as they see them and remember that debate is central to scientific

progress. They should recognize that straddling a fence too long can produce sterility, and that when one has reached the point of making all his communications non-controversial, there is no further need for him to communicate" (Eipper, 1970).

Mining in the BWCA has not begun, and the question of further exploration is still to be settled. Moreover, no mining for either copper or nickel has yet taken place in the gabbro outside of the BWCA. There is still time to examine the issue and weigh the alternatives.

It is also appropriate for me to "call the shots" as I see them. It is my judgment that the Boundary Waters Canoe Area should be closed to mining and retained as a natural area in its wilderness state.

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