



FROM THE QUETICO-SUPERIOR FOUNDATION • WINTER 1974-75

RECENT BWCA DEVELOPMENTS

In August International Nickel Company reportedly assured Governor Wendell Anderson in a letter that it would not build a smelter to refine copper-nickel ore near Ely or within the Superior National Forest. The assurance from INCO was in response to an earlier letter from Governor Anderson.

Judge Miles Lord in September temporarily banned logging and road construction in BWCA virgin timber land until the Sierra Club-MPIRG suit asking for a permanent ban could be heard.

On October 8, 1974, the Minnesota Environmental Quality Council voted to require an extensive environmental impact statement covering the northeastern part of the state before any mining of copper-nickel ore will be permitted there.

In mid-November the EQC voted eight to two not to require an environmental impact statement on the AMAX 1700-foot test shaft and underground excavation near Babbitt, Minnesota. On December 3 four environmental groups, MPIRG, MECCA, United Northern Sportsmen, and Clean Air-Clear Water Unlimited, sued the EQC to reverse their November decision, charging the EQC with failure to comply with state law. The environmental groups felt that an adequate study of the potential impact of copper-nickel mining in northeastern Minnesota should be completed and discussed before permission is granted for any new mining in the area.

The North Star chapter of the Sierra Club and the Minnesota Federation of Ski Touring Clubs filed appeals with the U.S. Forest Service on October 16 ask-

ing the Service to reverse its decision and ban the use of snowmobiles in the BWCA. The organizations contended that snowmobiles destroy the primitive character of the BWCA and are inconsistent with the 1964 Federal Wilderness Act.

U.S. District Court Judge Miles Lord in early November began hearing a law suit entered by MPIRG and the national Sierra Club against the U.S. Forest Service and several private logging companies. The two environmental organizations contend that logging violates the 1964 Wilderness Act and the 1969 National Environmental Policy Act, and they are asking Judge Lord to ban logging in the BWCA. Judge Lord's decision in the trial is expected within two weeks.

COPPER-NICKEL MINING IN MINNESOTA — A CASE STUDY IN THE NEED FOR RESPONSIBLE ENVIRONMENTAL DECISION-MAKING

by ERNEST K. LEHMANN*

Two responsible mining companies have requested permits related to exploration and development of copper-nickel mining in Minnesota. The action brings Minnesotans, especially those interested in the BWCA and its environs, face to face with serious environmental choices.

This situation is an outgrowth of the discovery in 1949 of copper-nickel mineralization in a U.S. Forest Service road cut near the south shore of the Kawishawi River just south of Ely. In

the years following this discovery, there were several periods of intensive exploration in geologically favorable areas and several millions of dollars were expended by about a dozen companies. This exploration resulted in the discovery of two mineralized zones near the Kawishawi River by International Nickel Company (INCO).

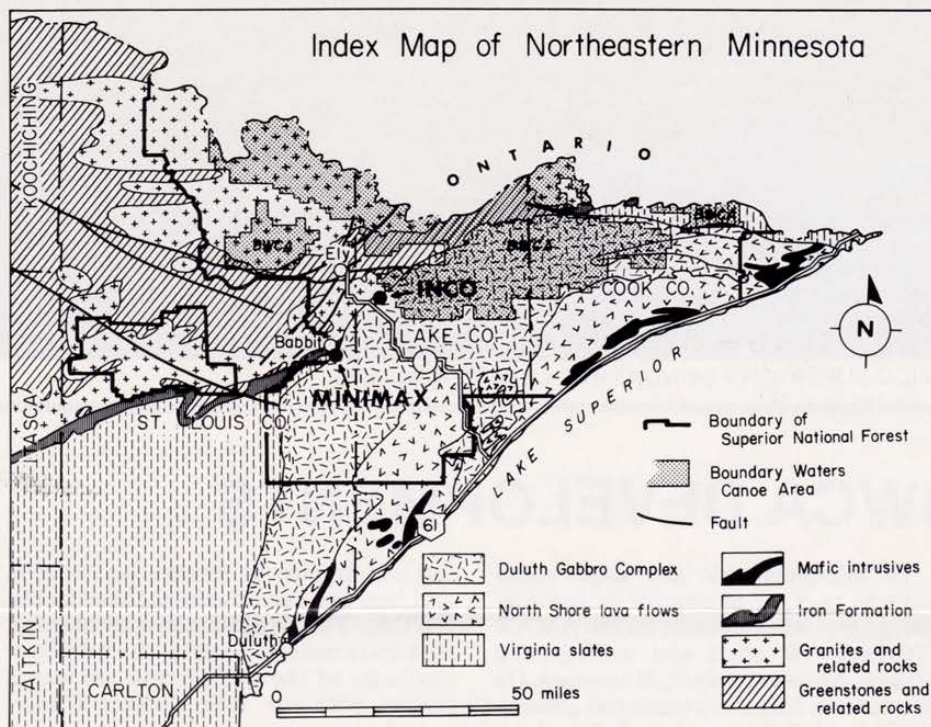
Another outgrowth of this exploration was the discovery, exploration and delineation of a mineralized zone near Babbitt by a subsidiary of Ken-

necott Copper. This area has since been acquired by American Metal Climax (AMAX) and is the site of their Minimax project. A third, small and up to now non-economic copper-nickel deposit was found further south by another major mining company, and a fourth, possibly economic deposit, is rumored to have been discovered by yet another.

To appreciate why these many years and millions of dollars of effort have

(continued on next page)

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resulted in such a few discoveries, one needs to appreciate something of both the nature of valuable mineral deposits, 'ore deposits', and of the geology of this particular area of northern Minnesota. An 'ore deposit' is a body or group of bodies of mineral-bearing rock which is commercially mineable. That is, to be an 'ore deposit' the body can be mined at a profit when all factors are considered such as the contained quantity of the valuable constituents, the proximity of the deposit to the surface, the ability of the operator to economically extract the valuable constituent from the contained rock and the proximity to transportation and markets. Even though a metal or mineral may be widely dispersed in the earth's crust, it is only rarely that a substance occurs in sufficient concentration and quantity, in a form and in a location and setting that permits commercial extraction. For example there is only one small nickel deposit being mined in the United States today and in 1973 there were only 25 copper mines producing 92 percent of U.S. domestic copper production. However, since the definition of an orebody is essentially an economic one, the combination of improved search, extraction and processing technology, combined with improved prices, may change a non-economic mineral deposit to commercially extractable ore deposit over a period of time.

Before discussing the specific problems raised by the two proposed projects it is important to look at the geologic setting in which they are found.

The copper-nickel deposits of Minnesota are associated with a particular group of 'basic' igneous rocks which includes the Duluth gabbro complex. The

Duluth gabbro complex is a compound body consisting of a large number of igneous intrusives. The outcrop area of the gabbro complex is boomerang shaped, extending from the eastern part of Cook County westward through northern Lake County, then trending southwest to the vicinity of Hoyt Lakes and then running south to Duluth. Within the complex, copper and nickel of possible commercial importance occur principally associated with certain particular phases of the gabbro, mainly those phases rich in the silicate mineral 'olivine'. These olivine-rich gabbro zones are concentrated as small bodies mainly along the northern and western edge of the gabbro complex. It follows from this concentration that most of the area favorable for prospecting (probably 80%) is outside of the BWCA. Even within the favorable zone, the areas in which copper-nickel mineralization occurs in commercial or near-commercial quantities is very limited. Along the en-

tire favorable basal part of the gabbro, exploration to date has indicated commercial or near-commercial mineralization along only perhaps 2% of the contact. Probably better than half of this amount can only be mined by underground methods.

The two currently announced copper-nickel exploration or mining projects of major importance which are the focus of this discussion are located outside of the BWCA. A third project has been much in the news. This is the attempt by the George St. Clair interests to explore within the BWCA their own retained mineral rights and those mineral rights leased by them from other private parties. This project, which is the subject of a law suit brought by the Isaac Walton League, involves some particular equities, problems and possible strategies that are beyond the scope of this article.

The INCO exploration resulted in the delineation of two mineral deposits. One is a slightly higher grade, deeper deposit west of Highway 1 and south of the Kawishawi River. The second is east of the road, essentially at the site of the original 1949 discovery. The first mentioned deposit was investigated by a 1200 foot shaft put down in 1967. This work indicated the deposit was and still is currently not economic, based on grade and continuity of ore and mining conditions and costs. A recent reevaluation of the other deposit, east of Highway 1, suggests that an economic operation could be undertaken on that orebody by operating an open pit mine which would produce approximately 50,000 tons of metallic copper and 12,500 tons of metallic nickel per year from the mining of about 12 million tons of ore annually. According to INCO, the resultant pit, after 20 years of operation, would cover an area of roughly 500 acres. After this initial 20 years of production, the operation may have another 20 years, or more, of life remaining as either an open pit mine and or an underground operation. Mining the ore would require stripping overburden and waste rock at an



QUETICO SUPERIOR FOUNDATION BOARD MEMBERS AND GUESTS AT INCO TEST SAMPLE SITE.

average annual rate of 18 million tons. After mining, the ore would be mixed with water, ground and subjected to concentrating by a process called 'flotation' in which the valuable sulphide minerals, containing as much of the copper, nickel and other valuable metals as possible, are separated from the ground waste rock and are gathered in a 'concentrate'. The concentrate may constitute about 5% of the original rock. The balance, ground rock of sand or silt size, constitutes 'tailings' which will require disposal in a tailings basin. Such a basin might cover an estimated 1000 to 1500 acres after twenty years. The concentrate would then be shipped to a smelter where further processing of the concentrate would take place to recover the valuable metals in metallic form.

In order to make a determination of the best processes to use in concentrating the valuable minerals, recovering the contained metals, and reclaiming tailings basins, INCO, with permission of USFS, mined a 10,000 ton sample of ore. The small resultant pit was resurfaced. The material mined was shipped to a pilot plant in Canada for testing. Tests on tailings reclamation practices were still continuing this past fall as were the technical and economic evaluations of the results of the processing tests. In addition, the company is in the process of conducting various 'baseline' environmental studies including ones on water quality.

The AMAX project is in a different status. AMAX has applied to the State for a series of permits which would permit it to sink a 1710 foot shaft and con-



HEADFRAME OF INCO PROPOSED SHAFT SUNK IN 1967.

TABLE I
COMPARISON OF U.S. PRIMARY DEMAND WITH U.S. PRIMARY CONSUMPTION (SHORT TONS)

| | 1970 (Actual) | | 1985 (Projected) | | 2000 (Projected) | |
|-------------------|----------------|--------------------|------------------|--------------------|------------------|--------------------|
| | Primary Demand | Primary Production | Primary Demand | Primary Production | Primary Demand | Primary Production |
| Copper (000 Tons) | 1572 | 1720 | 2900 | 1910 | 5400 | 2380 |
| Nickel (000 Tons) | 155 | 15 | 246 | 30 | 385 | 42 |

(Source: J.D. Morgan, Jr., 1973)

TABLE II
Per capita consumption of refined copper (Kilograms per capita)

| | 1950 | 1960 | 1965 | 1970 |
|--------------------|------|------|------|------|
| United States | 9.9 | 7.6 | 9.2 | 9.6 |
| Rest of World | 0.7 | 1.2 | 1.4 | 1.6 |
| Total World | 1.2 | 1.6 | 1.8 | 2.0 |
| Belgium-Luxembourg | 2.0 | 2.9 | 3.8 | 3.3 |
| France | 3.0 | 5.3 | 6.0 | 6.8 |
| West Germany | 4.1 | 10.2 | 10.2 | 12.0 |
| Italy | 1.5 | 3.9 | 3.8 | 5.9 |
| Spain | 0.6 | 1.6 | 1.9 | 1.9 |
| Sweden | 3.9 | 13.0 | 13.3 | 14.1 |
| United Kingdom | 8.0 | 11.3 | 12.1 | 9.8 |
| Japan | 0.4 | 3.3 | 4.9 | 9.3 |
| Canada | 6.9 | 7.0 | 11.1 | 23.1 |
| Australia | 3.4 | 7.0 | 7.1 | 9.0 |
| South Africa | 1.0 | 2.2 | 0.9 | 3.9 |
| U.S.S.R. | 1.6 | 3.1 | 3.8 | 3.9 |
| Yugoslavia | 1.1 | — | 3.2 | 6.4 |

(Source: National Commission on Materials Policy, 1973)

duct some underground mining for the purpose of obtaining information on the quality and continuity of the ores. This course is a prudent one to follow before investing large amounts of capital in facilities. From the environmental aspect, AMAX's program includes utilizing information obtained during and concurrent with this exploratory work in prediction of environmental effects and in designing ways to mitigate adverse ones. The company reports that it has initiated an elaborate water quality study and air quality and biologic studies in the area. It further plans extensive studies of the weathering characteristics and effects of surface water leaching on low grade ore or waste rock that might be stockpiled at the surface in the course of mining operations. These studies could not be carried out without the samples to be taken by mining. If the exploration project results are favorable and proper environmental protections can be devised, the company has indicated it would then return to the State for permits required

for commercial operation. This operation would be an underground mine and related surface facilities probably producing on the order of 4.5 to 7.5 million tons of ore per year of slightly higher grade than the INCO ore.

The possibility of copper-nickel development in Minnesota at the INCO and AMAX locations focuses attention on critical choices in making land use decisions. On the one hand, in the area are potentially important deposits of minerals vital to our industrial civilization. On the other hand, one deposit is located immediately adjoining the BWCA, an area of unique ecological and recreational resources.

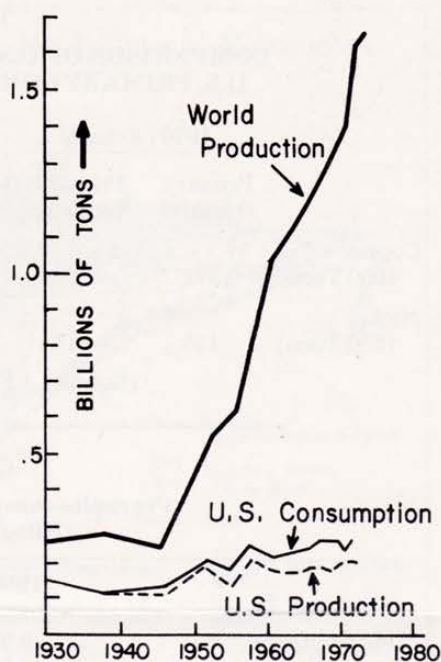
For those who oppose the possible development of copper-nickel resources in Minnesota, regardless of location, several easy arguments suggest themselves. These are encompassed in suggestions such as that all questions be answered before any work is undertaken, that we cut consumption, that we supply raw materials through recycling

or that we conduct mining operations 'somewhere else'. Unfortunately these suggestions do not deal with legitimate problems in a realistic manner.

All the 'questions' can never be completely answered, but a well prepared environmental impact statement should come close to asking and answering questions. Such a statement should be a serious assessment of problems and solutions, based on solid facts insofar as they are reasonably determinable. However, the evaluation of each proposed development is a separate problem and requires determination of factual data related to the particular setting. For example, AMAX's proposal is an attempt to develop necessary factual data to evaluate that specific project. Based on this body of fact, an evaluation can be made of specific problems within a specific natural and economic framework.

Arguments being made to cut consumption and spur recycling of resources have substantial validity. In actual fact, consumption per capita of many metals in the U.S. has already leveled off, as has U.S. population. The most rapidly rising resource consumption rates are in the other developed countries. As third-world living standards improve, the consumption rates of mineral commodities in these countries will also tend to increase on a per capita basis. These mineral commodities are essential to make the tools and build the basic industries required to increase food production and the quality of life in these countries. For the third-world's living standards to rise in the face of declining high grade raw materials sources, will require the developed countries to make substantial efforts to reduce consumption of new raw materials through recycling. Recycling will inevitably increase as commodities become scarcer and raw materials prices rise. This rise in real prices of most mineral commodities is inevitable since at a given price there is only a finite quantity of any mineral commodity economically available in the earth's crust. However, though recycling can be encouraged, it will only supplement, not supplant, primary production. Neither recycling nor reduced primary consumption by developed nations will be sufficient to supply increasing worldwide demands and new primary raw materials sources will continue to have to be developed.

To suggest that we can obtain all our raw materials requirements elsewhere in the U.S. or elsewhere in the world is to export our environmental problems and to avoid making our own difficult choices and decisions. Whether we wish it or not we are faced with these choices and decisions because the geologic history of Minnesota has resulted in the location within the State of substantial



World production, and U.S. production and consumption, of 18 minerals (iron ore, bauxite, copper, lead, zinc, tungsten, chromium, nickel, molybdenum, manganese, tin, vanadium, fluorspar, phosphate, cement, gypsum, potash, sulfur), 1930-1971.

(Source: E. N. Cameron, 1973)

valuable mineral resources. Mineral resources are finite and the metals in question are essential to providing for a reasonable subsistence level for mankind. It follows that those commodities that are essential must be extracted wherever they are found, consistent with the good of the world community as a whole and subject only to the existence of some higher value that precludes their extraction. For example, let us say that nickel stainless steels are essential to fabricate efficient equipment for drying fish meal, a high protein human and animal feed supplement produced in plants in Peru. To preclude development of nickel or low cost iron sources in one area of the world raises the prices and reduces the availability of stainless steel and its products. This in turn raises the prices and lowers the availability of protein to some segment of the world's population. By a comparison, a decision by the State of Florida to ban or severely limit mining of phosphate, a basic fertilizer material, would have an immediate and important effect on the cornfields of Minnesota and the rice paddies of Southeast Asia.

In a time of economic crises, existing in part because of the high cost of imported fuels, it would also seem economically inconsistent and unsound not to encourage judicious development of domestic resources which would either reduce imports or increase foreign exchange earning exports.

It would appear that, only where some genuinely greater value is significantly affected, should carefully controlled mineral development be prevented. For the foreseeable future, this would preclude mining within the BWCA proper. However, it is not prudent or rational to extend the concept of 'wilderness' indefinitely and to include large areas which can and should be managed in an acceptable manner as multiple use areas for development of all resources including minerals, timber and recreation. The major concern of those interested in the BWCA should be to stringently protect limited designated wilderness areas from logging, recreational overuse and the like. To indefinitely extend wilderness boundaries either legally or in a de facto manner is neither economically realistic nor ethically justifiable. If an area does not have genuinely significant unique ecological, scenic or other attributes and if operations can be carried out and the area can be reclaimed in an environmentally acceptable manner at a cost that the operator is prepared to accept, then the imperatives of the world's needs for natural resources suggest that development is not only acceptable but probably desirable. Assuring acceptable development will require that the local and State governments have the tools with which to insure compliance to reasonable standards. In order to make determinations regarding copper-nickel projects Minnesotans have the right to expect as much technical information be made available as can be reasonably obtained. The project sponsors have a right to try to obtain that information and an obligation to present it candidly. Government agencies and the public need to evaluate this data competently and objectively. The final decision must be based on a rational analysis of available data, on best choices made on the basis of reasonable assumptions and in a spirit of open-mindedness and cooperation by all the parties.

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