

**Reply to the Commentary by
Dr. John C. Reed**

The *Commentary* by Reed in *Arctic* 15:3 expresses opinions not shared by many of those who are interested in the future of the North. The quotation from Robertson, with which Reed agrees, is virtually a touch-stone for those engaged in the exploitative and extractive industries, whether in the arctic, temperate, or tropical zones. It is also, in my opinion, quite outdated. For example, it was formerly believed that the extractive industries were the mainstay of the non-military Alaskan economy, yet Buckley¹ clearly showed that the financial return from fisheries and wildlife is greater. One can also recall statements in old books about the wasteland of the "Great American Desert" and of "Seward's Folly".

Modern concepts of land use postulate uses for all land and water, categorized on the basis of greatest sustained yield as indicated by scientific evaluation of energy flow through the system. Consequently, a region capable of producing "x" calories per unit of time is just as important to a nation's overall plan as one producing "100 x" calories. The contribution of the x-calorie region is not to be dismissed as unimportant. A nation's income or economic base is composed of a great number of x-calorie regions and relatively few 100x regions. Moreover, the contribution from a small sustained-yield resource is of much greater long-term value to the human race than the contribution from a larger but soon-exhausted extractive or exploited resource.

No student of boreal ecology denies that the Arctic and Subarctic have relatively low actual and potential biomass productivity. It is also agreed that the ecological system of soil-plants-animals is easily thrown out of balance by exploitative use. (Recall the exploitation of baleen whales in arctic Alaska and the resultant catastrophic reactions in people, caribou, and white sheep). Consequently we must know the workings of the ecosystem in considerable detail to make certain that the

exploitative activities do not unintentionally upset the system. The multiple-use concept requires this approach. Research aimed at understanding the northern biosphere is far more pressing than research furthering extractive activities. Management activities on the surface can hardly destroy the minerals and oil underground, but ill-considered and uncontrolled exploratory or extractive activities for minerals and oil can easily destroy the natural ecological system of soil, plants, and animals.

The quotation from Bader projects a ray of hope for the North American Arctic into a picture that is otherwise progressing towards a gloomy repetition of the unwise exploitation that occurred over much of the rest of the continent. We need more Arctic Agricultural Experiment Stations, to be sure. But even more important, we need stations for basic biological and environmental research to allow us first to gain more of an understanding of general life processes. Before we embark on agricultural schemes we need this basic knowledge (1) to channel the applied research along the most promising avenues and (2) to tell us whether agriculture, or pisciculture, or management for fur, or reindeer breeding, or managed wild caribou, or wilderness control area is the best use for a particular region. In the proposed stations for applied research we sorely need more vision and imagination. We have had almost too much of the "giant-Alaskan-cabbage" type of approach. In the North American Arctic and Subarctic we need a vision for northern research compounded of, for example, the moose domestication work on the Ilich-Pechora Reserve, Dassman's African work on managed commercial use of native wild ungulates, Teal's musk-ox domestication work in Vermont, the Icelandic approach to eider use, experiments on the possibility of increasing the yield of native plants such as *Hedysarum*, *Vaccinium*, and *Rubus*, experiments on the potential value (and possible danger) of imported plants such as *Pinus cembra*, as well as work on economically raising soil tempera-

tures, and pisciculture in nuclear-heated ponds. To use some resources more rationally than at present we shall have to change laws and frameworks of government and thus we need to know more about the psychological and cultural bases of such concepts as *game, crop, resource, land-ownership, predator, property rights*, so that laws and governmental framework can be modified without trauma. We also need more work along the lines of Buckley's cited survey of the value of wildlife products and of Foote's still-uncompleted field research on human ecology of an arctic village in ecological harmony with its environment. Equally important, we must have work on determining the size of wilderness reserves needed for scientific control areas and where to establish them so that they can tell us how well (or badly) our schemes are running. In this regard a quotation from a recent paper by Kirikov² is pertinent, although it refers specifically to the steppe region of the Soviet Union. "Our generation deplors that our ancestors, through greedy pillaging, destroyed the sea cow and the aurochs. The generation following us will judge our achievements with great severity if we do not preserve steppe regions of a size sufficient for all requirements of their animals and plants. For among the destroyed steppe animals and plants there may be found species no less valuable than the sea cow; and their value may be entirely unknown to us because they are known only superficially. To destroy completely these barely known species would undoubtedly bring about harmful consequences. It is necessary to preserve all endangered species in some numbers.

"In the creation of State Protected Areas there is another goal of no less importance. Nature preserves are not only for careful conservation but for study. Many processes and phenomena that go on in nature also occur in situations where they exert powerful influences on man's economic interests. In order to learn the natural laws governing such processes and phenomena it is necessary to have control areas

where scientific investigations may be conducted under natural conditions undisturbed by man. Such control areas are possible only in State Protected Areas. Research, one of the fundamental requirements of which is the comparative method of investigations of protected and ordinary conditions, conveys the possibility of foreseeing in which direction a distant change in nature is proceeding, and consequently rejecting or changing the direction of man's economic activities if it might bring on waste or destruction of natural wealth."

Perhaps the greatest obstacle to a balanced program of research on northern resources are inappropriate temperate zone concepts. All permanent human occupancy of land (as Dr. Bader points out) is based on local use of renewable resources. In the temperate zone man can get away with such misuse of the land as strip-mining and burning forests so as to expose the country rock because vegetational succession is relatively rapid and the land can recover. In the Arctic and Subarctic all schemes for exploitation and use must be rigidly controlled because the consequences of misuse (through faulty application of traditional temperate zone procedures) are extreme and long-lasting. The temperate zone concept of *laissez-faire* in regard to everyday use of renewable resources is a dangerous concept for the Arctic and Subarctic.

My elaboration of the necessity of research on the biosphere of the North should not be construed as a blanket condemnation of the extractive or exploitative industries (or use of non-renewable and non-expendable resources as Reed calls them). Wise use of *all* resources should be encouraged and that is the point of this note. But even in their wildest dreams the miners, oil-drillers, airport operators, or radar operators could not use more than probably 1 or 2 percent of the actual land surface of the North. What is to be the fate of the other 98 per cent of the land and the plants and animals (including man) that depend on it?

WILLIAM O. PRUITT, JR.