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Geology and the New Conservation Movement

Geologists, conspicuous by their absence from today's conservation groups, can make a contribution.

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The Conference of Governors and the North American Conservation Conference called by President Theodore Roosevelt in 1908 and 1909, respectively, marked the beginning of a nationwide awareness of natural resource problems and were the culmination of a series of reports, recommendations, and laws written over the preceding half-century (*1*). Between 1910 and World War II the conservation movement was concerned mainly with preventing the destruction and waste of natural resources—with soil erosion, deforestation, and the waste of mineral resources. Since World War II a new dimension—cleanliness and beauty—has been added to the conservation effort, and for the first time, air and water have been a major focus of attention. Of course, in previous years conservationists became alarmed and exercised about local pollution, but only in the present decade have the pollution of the atmosphere, ground, and surface waters and the destruction of natural beauty received nationwide attention. Through sudsy streams, salty wells, and smog, pollution has touched a large body of citizenry.

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The history of conservation in the United States has been chronicled by Stewart Udall in *The Quiet Crisis* (*2*), whose chapter titles themselves summarize the development of the movement: "The stir of conscience—Thoreau and the naturalists"; "The raid on resources"; "The beginning of wisdom —George Perkins Marsh"; "The beginning of action—Carl Schurz and John Wesley Powell"; "The Woodlands—Pinchot and the foresters"; "Wild and park lands—John Muir"; and "Men must act—the Roosevelts and politics."

Today conservation means different things to different people. Some of the most vocal conservationists are really preservationists—opposed to change. They resent the march of row houses into the rural scene, they fight its subdivisions which rout wildlife from its woodland homes, and they bitterly oppose the extractive industries that consume natural resources and convert them to material and energy products. Within cities, they attempt to prevent fine old buildings that are no longer economically useful from being destroyed to make way for new, modern structures. They are strongly motivated to preserve the past as part of the heritage of the future. Perhaps they really are reacting against the disappearance of the world of their youth, a world which most of us remember as a better world than the present-day one, probably because youth usually feels better than middle or old age. Organized into heritage societies, historical societies, sportmen's clubs, garden clubs, and conservation federations, these groups have locally been effective in forcing a careful review of projects which propose to make major changes in the natural scene or raze structures of historical interest.

How High a Price?

But however worthwhile the preservationist movement might be in some instances—and I confess to preservationist sympathies—in others it is unrealistic in asking society to pay too high a price for the past. The preservationist lives in our modern industrial society and enjoys its benefits. These are not without their price. The preservation of an old building simply as an architectural and historical monument in the midst of a growing city where there is great demand for space can hardly be justified unless the building can be converted to serve a useful purpose as well as being a monument. This is the concept of multiple use. Likewise, preservation of a potential rock-quarry site as a woodland glade constitutes elimination of a valuable mineral resource and costs society a substantial amount in lost tax revenues and lost payroll. If crushed rock must be hauled a long distance because the more strategically located resource is denied to society, then building costs in the area rise accordingly. In line with the multiple-use concept, the rock could be quarried over the economic life of the deposit and thereafter the area could be landscaped and restored for other uses. The question is—what is the price of preservation and can we afford to pay it? In some cases, we can and should pay the price; in others, the price is too high. Conservation, on the other hand, is long-term economy and we must pay the short-term price for it.

Although conservation is frequently defined as effecting a harmony or balance between man and his environment,

such a goal can never be achieved in an industrial society because an industrial society by its very nature consumes and changes its environment. It devours huge quantities of minerals—nonrenewable natural resources—and spews great quantities of toxic products into the environment. Only an agricultural or pastoral culture with a more or less stable population can achieve true harmony with the environment. The best an industrial society can do is, through knowledge of ecology and through planning, to minimize disruptive changes, to dispose of toxic waste products in safe systems, and to use nonrenewable resources conservatively in the most advantageous way possible. Conservation in this sense is applied ecology and goes beyond the former emphasis on wise use and elimination of waste. The 1964 Conservation Yearbook of the Department of Interior stated (*3*):

> The program of more and prophetic stewardship being forged today is both careful and daring. Conceived on a truly national scale, it is deeper than soil conservation, broader than wildlife preservation, more penetrating than forest husbandry, more encompassing than control of air and water pollution.

It is obvious that the success of the new conservation movement, or any conservation movement, depends on control of population. Projection of rates of growth of the world population today, ranging from slightly over 1 percent in the developed countries to over 4 percent in some of the developing areas, makes it clear that the matter is one of very grave concern (*4*). These projections indicate a world population of 6 to 7 billion at the turn of the century and, continuing the same rate, of 25 billion by the year 2070. These rates are higher than any foreseeable economic growth rate, so at best we are faced with a declining living standard and increasing competition for the earth's food and material resources. There are bacterial cultures that multiply to the point where their population exceeds the food resources of their environment and they starve to death; there are bacterial cultures that multiply to the point where the toxic products they produce so befoul their environment that they poison themselves. Commonly, the self-destruction results from both factors operating simultaneously. To draw an analogy with the human culture is not pleasant but is clearly indicated. Only the time scale is different.

One of the most thoughtful definitions of conservation was formulated in 1935 by a geologist, C. K. Leith (*5*). It presented a clear preview of the conservation movement of the 1960's.

> Conservation is the effort to insure to society the maximum present and future benefit from the use of natural resources. It involves the inventory and evaluation of natural resources, calls for the maintenance of the renewable resources at a level commensurate with the needs of society, and requires the substitution, where the conservation of human energy permits, of renewable or inexhaustible resources for those which are non-renewable, and of the more abundant non-renewable resources for the less abundant ones. It not only seeks to eliminate waste of resources if use be economically feasible but also looks forward to improvements in techniques of production and use, and requires that there be prompt and proper adjustments to advances in technology. It thus appears that conservation involves the balancing of natural resources against human resources and the rights of the present generation against the rights of future generations. It necessitates, moreover, the harmonizing of the procedures and objectives of conservation with the conditions of the present or future economic order, and calls for a careful allocation of duties and powers among private and public agencies.

This definition requires careful study and raises many questions because it includes many elements. It calls for inventory and evaluation of resources. With regard to minerals this is an extremely expensive program if carried out in any detail. Who should carry it out, and on what scale? The program calls for maintenance of renewable resources at an optimum level. This involves economic studies and projections to determine the proper level of maintenance and some kind of action to insure that production will be adequate. Is it really necessary to program production of renewable resources, or is a free-market economy the best way of matching production and demand? The answer to this question is intimately bound up with political science and philosophy of government. Leith's definition calls for substitutions. Are these to be effected through government controls and allocations or through operation of a free-market system? During World War II the government found it necessary to allocate certain commodities for certain purposes and to require substitutes for less critical purposes. The war was in a sense a prelude of the future because demand exceeded supply and priorities had to be established and enforced. Most definitions of conservation call for elimination of waste. How? Through inspection of extractive industries by government engineers and the closing of wasteful operations? Drastic legislation would be required to legalize such supervision, although some such legislation already exists in special cases—for example, to prevent flaring (burning) of natural gas where no market exists. The definition calls for balancing the rights of the living against the rights of those unborn. Those to come have no representation except those living who have a strong sense of human destiny, and they are all too few.

The Right To Own Property

This brief analysis attempts to point out that the mechanisms required to implement the worthy objectives of conservation present very knotty problems in themselves and are inextricably tied to philosophy of government. If, on the one hand, government's responsibility is to protect the rights of the individual and guarantee maximum individual liberty and, on the other hand, the government is to enforce conservation of natural resources, some difficult compromises must be made. One of the basic individual rights in the United States is the right to own property. This is certainly in conflict with government management of the land. But what good is planning if the plans cannot be implemented? Perhaps relinquishment of private property rights is too high a price to pay for conservation? These questions are raised to present some idea of the gravity of the conservation decisions which must be made.

Planning and implementation of those plans on a nationwide scale can be most efficiently accomplished where the government has complete authority and the indivdual has none. Under such a system, for example, an oil field can be exploited solely on the basis of engineering considerations, uncomplicated by the rights of property owners. Resources can be allocated to their highest use; silver, for example, might be reserved exclusively for the photographic and electronic industries with use for tableware and jewelry prohibited by decree. To a degree, private property rights are already subordinate to conservation laws, and for this reason conservation has been called by some the road to socialism. Our system of government has attempted to achieve a balance between individual rights and the public interest. Clearly, a property owner should not be allowed to dump

poisonous wastes in a stream and thus injure a large number of other individuals. Clean water is an essential to survival. In other cases, however, definition of the public interest is not so easy. Should a property owner be prohibited from building a structure on his property simply because his neighbors do not like the looks of it? Esthetic considerations are after all a matter of personal preference and are not subject to measurement by ordinary standards. What good is the right to private property if it cannot be exercised? Or should the owner of a valuable mineral resource be prevented from mining it and required to "put it in the bank" for the future because foreign supplies of the commodity are currently plentiful?

An interesting conservation decision was made recently in the state of New Mexico by the New Mexico Oil Conservation Commission. An oil company with a lease on state land proposed to drill a deep exploratory well to test a promising structure. However, as located, the well bore would pass through the unmined part of a potash ore body at a much shallower depth and cause revisions in the mining program of a potash mining company. The potash mining company moved to deny a drilling permit to the oil company. There was considerable testimony offered concerning the damages that would be suffered by the mining company and how much potash ore would have to be left around the well bore in the interest of safety to prevent subsidence. At the conclusion of the hearing, the Commission denied the permit to the oil company on conservation grounds, reasoning that it would prevent waste if drilling of the well were delayed until after all the potash ore had been mined, when the potential oil structure could be tested without requiring that potash ore be left in the workings.

Another conflict between resource users is currently being fought along the Texas Gulf Coast, where miners of oyster shell have come into conflict with commercial fishermen and sportsmen. Shell from dead reefs is mined by dredge and sold as a high-calcium raw material for the chemical industry, including lime and cement manufacture; it is also valuable for its physical properties and is used as a concrete aggregate and road base material because of a shortage of hard rock along the Texas Gulf Coast. Supplies of shell have been depleted in some parts of the coast, and the operators want to move into new ground previously denied to them because of proximity to live oyster reefs. The dredging operation muddies the water and is harmful to the living oyster colonies. Oyster fishermen have moved to deny the request, and they have been supported by other commercial fishermen and sportsmen's groups who regard live reefs as an asset to their business and pleasure. A compromise by the Texas Parks and Wildlife Commission, the state regulatory agency, was unacceptable to the fishermen and is being challenged in the courts. The use of oyster shell as an aggregate and as a road base material is a lower use in that a material which fulfills the more exacting requirements for chemical-grade raw material is used for a purpose which requires only that it be hard and abrasion-resistant. In the absence of competing gravel and crushed-stone deposits, it is also the cheapest aggregate and road base material available. The question might be raised—is it in the best long-range interest of Gulf Coast industry for oyster shell to be used up in construction, or should it be conserved for higher industrial uses? One reason that the question cannot be answered is that there is no inventory of shell reserves. The amount of shell that remains to be recovered is not known. As a practical matter, the shell industry produces about 11 million cubic yards (8½ million cubic meters) of shell per year, valued at more than 15 million dollars; more than half was used in road building and constructional industries. Many other industries are related to or based on the shell industry. Royalty paid to the state of Texas is more than one and a half million dollars. Thus in any conservation decision made in this case, many factors and the interests of many groups, some of whom do not even know they might be affected by the decision, must be weighed.

Conservation decisions, like other decisions, can rapidly be made obsolete by technology or economic changes. In a world guaranteed completely open to free trade and perpetually at peace, conservation policies governing domestic mineral industries probably would be very different than in the present world, where foreign supplies might be suddenly interrupted and national security is of overriding importance. In such an ideal world mineral stuffs would flow from regions of abundance to regions of scarcity, from raw-material producer to consumer, solely along economic gradients. But even in such an ideal world, the need to industrialize to support burgeoning populations and raise living standards would gradually alter trade patterns so that more and more minerals would be consumed by the producing country and eventually, as presently dictated by reasons of security, a big industrial consumer like the United States would have to look to its low-grade ores and its lean oil fields. It would be unwise to allow conservation decisions based on the current availability of cheap foreign minerals to strip us of our capabilities to move down the domestic resource ladder and to exploit lower- and lower-grade earth materials. It is true that we wrong future generations by wastefully consuming the high-grade resources of the earth; it is equally true that we commit a wrong if we leave them no capability to utilize the low-grade materials they inherit.

The Extractive Industries

There is a disturbing aspect of the new conservation movement in that the extractive industries and the mineral industries in particular are regarded as rapacious despoilers and looters of the nation's resources. To what extent this attitude is based on past history and to what extent it is due to the ugliness of a scar on the land left by a mine or a quarry is not clear. It is true that a noisy, dusty quarry with its snorting diesels and endless parade of heavy trucks is not pleasant to the eye as is a green meadow. However, it is certainly unrealistic for the lover of beauty who lives in the 20th century to expect that all such quarries should be located in someone else's area. If conservation teaching is honest and objective it must evaluate what the mineral industry contributes to modern society—what we get in return for the local ugly scars (which nowadays do not have to remain ugly after the minerals have been harvested). For example, the oil industry in Texas produces unpleasant smells, unsightly well fields, and salt water which is difficult of disposal. It also produces a product valued at about 4 billion dollars per year, which is indispensable to modern society, and which pays half a billion dollars in royalties to landowners, nearly 250 million dollars in state taxes, and 150 million to counties, cities, and school districts. It also produces jobs for some 216,000 people—one out of

every 17 Texans—and pays them salaries of nearly one and a half billion dollars per year. [The myriad satellite industries are not included (*6*)]. Needless to say, the employees pay taxes and support local businesses. Much of the blame placed on the industry for pollution has been misplaced. Recent studies indicate that concentration of salts from heavy irrigation and from natural salt and brine-bearing formations is the major cause of salt pollution in many parts of Texas (*6, 7*).

Many modern writers and commentators judge the modern mineral industry guilty because of the past deeds of the industry. In a sense this is analogous to Orwell's Ministry of Truth, which was engaged in rewriting history to make it conform to the present, or to the Soviet practice of rewriting textbooks to eliminate a past hero in current disfavor. The Appalachian coal fields, for example, were developed in a different society in a different time by an industry which cannot be held guilty for violation of laws passed 50 years thereafter. It was a time of wasteful exploitation of resources, when some individuals abused the land and appropriated the cream of the nation's resources for their own gain. It was also a time of human exploitation—of child labor and sweat shops in manufacturing industries such as the garment industry. We condemn all these practices today but do not find today's garment industry guilty for following in the 19th century the practices of the 18th century. On the contrary, the manufacturing industry is praised for its contribution to America's way of life. What about the mineral industry that built the great steel complex at Pittsburgh and along the Great Lakes? Perhaps it is not more guilty than the garment industry, and its contributions to society should be balanced against the excesses of the early exploiters.

What, then, is the place of minerals in this new conservation movement which attempts to exercise stewardship over the land through science and engineering? As long as America remains an industrial power, the extractive industries, including the mineral industry, must expand to supply minerals for materials, minerals for energy, and water and crop nutrients to sustain life. Thus conservation cannot and should not hope to decrease the volume of materials being extracted from the earth. On the contrary, government policies must encourage the industry on a broad front. Government will, in my opinion, however, exercise a good deal more control over the industry in the future, so that in many aspects of the mineral industry there will be overt or covert government-business partnerships or perhaps economic relationships. There are many ways that this can be effected without the government's assuming a proprietary interest in the enterprise. The economics of the mineral industry will change to meet new conservation laws—costs of land restoration will have to be recovered from income; costs of eliminating and disposing of pollutants, both air and water, will likewise have to be borne by the industry. Sulfurous gases will no longer be discharged in the air. Large volumes of wastes will be disposed of by injection into secure subsurface hosts.

In order to plan effectively, the government will have to know a great deal more about the mineral resources of the United States and will need to make a modern inventory of the various kinds of mineral resources left for future use. This will include detailed studies of the cost boundaries of various grades of resources. It will also require a great deal of data from environmental science and engineering studies which have not yet been made. Most important, the government, through administrative agencies or the courts, will have to act as arbiter among various conservation groups whose interests conflict. For example, it may be advisable in terms of wise use of mineral resources to mine sand and gravel from terraces along a river and even to dredge the river channel. Such activity might very likely be opposed by fish and wildlife groups. The conflict must be resolved on the basis of full information about the place of these various resources in an overall resource plan. The success of the conservation movement in the future will depend on how effectively the various segments of the movement can be pulled together into a comprehensive natural-resource ethic. Although some of the most famous of early conservationists were geologists—men like John Wesley Powell, John Muir, C. R. Van Hise, and C. K. Leith—geologists are conspicuous by their absence from today's natural-resource planning groups, local, state, and federal, which seem to be controlled largely by representatives of forest and range, recreation, water, and wildlife interests. Probably the geologists' greatest contributions to modern conservation have been their efforts, with petroleum engineers, to make state oil and gas conservation laws work and to more efficiently produce oil and gas reservoirs through unitization—contributions largely unsung. Perhaps geologists are regarded in government circles as champions of the mineral industry, rather than as conservationists. They are both and should behave as such; the two are not mutually exclusive. The counsel of geologists is essential in the development of a comprehensive natural-resource ethic.

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