



Summer 1976

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Recommended Citation

Robert C. Anderson, *Federal Mineral Policy: The General Mining Law of 1872*, 16 Nat. Resources J. 601 (1976).

Available at: <https://digitalrepository.unm.edu/nrj/vol16/iss3/16>

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FEDERAL MINERAL POLICY: THE GENERAL MINING LAW OF 1872

ROBERT C. ANDERSON

This paper evaluates economic aspects of the discovery process on open Federal lands. The discovery of hardrock minerals is regulated by the General Mining Law of 1872¹ which allows prospectors open access on unclaimed, open public domain lands in the Western United States. The criteria used for evaluating alternative procedures for the discovery of minerals include equity, efficiency, and administrative feasibility. Equity considerations, involving the distribution of income and wealth among present as well as future generations, center on issues such as the timing of discovery and development, and the allocation of economic rents between private and public ownership. Economic efficiency, satisfied when a given output is achieved at least cost to society, is violated when the search for minerals involves unnecessary and unproductive expenditures, and when the costs of environmental disruption resulting from mineral exploration and production are not incorporated in mining firms' decisionmaking. Administrative feasibility refers to monetary and non-monetary costs incurred by administrators and those subject to the regulations.

Present policy is deficient for several reasons. There is no centralized management over the timing of exploratory effort. The discovery process rewards exploration by giving away valuable mineral assets rather than offering exploration rights for sale by competitive bid. Although appropriate incentives exist for individuals to produce so as to maximize the present value of economic rents, few if any of these rents accrue directly to the federal treasury. Additionally, the taxation system that does exist serves in part to distort private incentives away from maximization of the rent accruing to all of society. Because of open access there is excessive exploration and the last prospectors to join the hunt for minerals do not contribute as much to society as they could in alternative forms of employment. A second form of inefficiency is created by the legal system under which claims are filed, and a third from the failure to internalize the costs of environmental disruption. Although accumulated experience has

* Institute Fellow, Environmental Law Institute, Washington, D.C. This paper benefited from advice and criticism from Ernest Hom, Laurence Sherry, Richard Spiegelman, Stephen Andersen, and an anonymous referee.

1. 30 U.S.C. §§521-31 (1970).

demonstrated the feasibility of the General Mining Law, costs incurred by the Department of the Interior in challenging the validity of mining claims and those incurred by the mining industry to defend challenged claims have been substantial, judging by the volume of litigation recorded over the past one hundred years. In addition to the costs, the fact that the Department of the Interior has no records of who claims which parcels of land or of the extent of mining operations following the issuance of mineral patents indicates that the Mining Law leaves much to be desired administratively.

THE DISCOVERY PROCESS

The image of the sourdough prospector coaxing his burro through the untamed West is exaggerated today. Today's prospector may drive a Jeep, have access to modern seismic data and other geophysical information, and possess other new prospecting tools. He may be self-employed,² but more often works for the mineral exploration arm of a major mining company. The lure of a big strike continues to attract individuals into this employment out of proportion to the wages to be earned. Despite the attractiveness of risky propositions to certain individuals, incentives for lone prospectors are diminishing rapidly. Recent developments in capital intensive forms of exploration, such as diamond drilling, airborne magnetic surveys, and chemical assays of aquifers by the larger mining companies have largely supplanted individual effort as a source of new discoveries.

Mining rights on most public domain lands, as distinguished from acquired lands which have been obtained through purchase or acquisition from private individuals, are obtained through discovery and development. Exploration proceeds without restraint until a showing of valuable minerals is obtained. At that point a prospector can stake a claim for mineral rights under the Mining Law of 1872. The requirement of a valuable showing is relevant to maintaining a claim only when the validity of the claim is challenged, and the vast majority of claims eventually prove worthless from the standpoint of mineral production.³ Claims can be of four types: lode claims which

2. According to the Office of Technology, Mineral Accessibility on Federal Lands, 4-5, (March, 1976 interim report), approximately 100 such prospectors remain today.

3. See R. Hansen, *The Mining Law: A Brief Primer for the Layman*, for a more thorough treatment of the Mining Law in operation, as well as a discussion of legislation preceding the 1872 Law. The ultimate use of mining claims was a point of interest in a recent GAO study. Visits to 240 randomly selected mining claims and 93 patented claims issued within the past 25 years indicated that mining was taking place on only one of the claims and seven of the patented sites. Of the patented sites 66 were not being used and 20 were in use for purposes totally unrelated to mining. See GAO, *Modernization of the 1872 Mining Law Needed to Encourage Domestic Mineral Production, Protect the Environment, and Improve Public Land Management*, Gov. Doc. No. GA 1.13:M66/6, (1974).

follow along a vein of mineralization, placer claims on a 20-acre rectangular parcel, tunnel sites, and mill sites on 5 acres of non-mineral land. To date more than 6 million claims are thought to have been filed, many of which have been abandoned. To maintain a valid claim at least \$100 worth of effort must be sustained in each year. Under the Mining Law a claim may be voided by a subsequent prospector or the Department of the Interior if the \$100 of annual effort cannot be proven by the claimant. The effort requirement has been criticized because it is all too often satisfied by the claimant making purposeless scars on the land. In cases where overlapping claims have been filed or boundary designations are subject to dispute, litigation in state courts often ensues.

Surface rights to a mining claim may be obtained through patenting a claim, which is a long and expensive process. The requirements include payment of a fee of \$2.50 per acre for placer claims or \$5.00 per acre for lode claims, and evidence of the possibility of profitable recovery of minerals. Approximately 64,000 patents covering some 2.9 million acres have been granted since 1872⁴ (see Figure I). Patenting confers several definite advantages to the owner of a mining claim including fee ownership of the land, the elimination of possible challenges from other claimants or governmental agencies, and increased ease of financing through outside sources. But patenting also has a distinct disadvantage. The patenting process involves both procedural and substantive requirements, and a claim is invalidated if it is determined that the requirements have not been satisfied. A patent applicant thus faces the real risk of losing his claim should the patent be denied.

In the 1920 Mineral Leasing Act⁵ certain minerals, primarily coal, oil and gas, were excluded from disposition under the Mining Law. By 1973 some 68 million acres of Federal lands were under lease for oil and gas and about 800,000 acres were under lease for coal.⁶ The Material Disposal Law of 1947⁷ and its extension, the Multiple Surface Use Act of 1955⁸, excluded several common materials such as sand, gravel, pumice, and clay from location under the Mining Law and provided for their sale at fair market value.

The main difference in the three mechanisms for mineral develop-

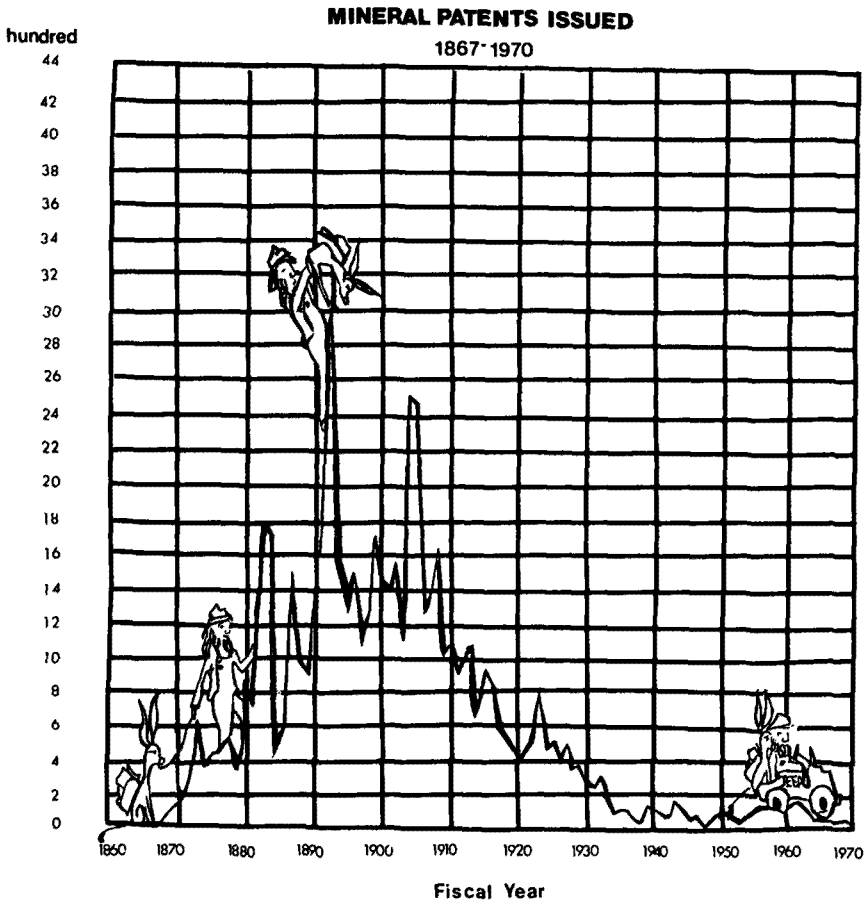
4. Statement by R. Morton, Secretary of the Interior, in Hearings on Mineral Development of Federal Lands before Subcomm. on Minerals, Materials, and Fuels of the Senate Comm. on Internal and Insular Affairs, Gov. Doc. No. Y4. In 8/13:M66/41, Item 1040 (1974) [hereinafter cited as *Hearings*].

5. 30 U.S.C. §§181 *et seq.* (1970).

6. *Hearings*, *supra* note 4, at 164.

7. Act of July 31, 1947, ch. 406, 61 Stat. 681.

8. 30 U.S.C. §§601, 603, 611-15 (1970).



ment is that the Mining Law of 1872 is self-executing and does not allow the Secretary of the Interior to weigh alternative public values, which he may do under the other systems of development before approving applications for title. Under the Mining Law of 1872 the Secretary has utilized two basic approaches to deny the statutory grant of rights in situations where he feels mineral development is inconsistent with proper land use policy. First he may withdraw lands from the domain of public land laws, rendering the Mining Law inoperable. The second approach has been to apply increasingly restrictive tests for the determination of value.

In the absence of Congressional reform of the Mining Law for the disposition of hardrock minerals, the Department of the Interior, through decisions rendered by the Secretary of the Interior until 1952,

the Solicitor of the Department of the Interior from 1952 to 1970, and the Board of Land Appeals since 1970, effected indirect reform through increasingly strict interpretations of the Law. The terms valuable and discovery in the 1872 Law were defined in the case *Castle v. Womble*⁹, in what has subsequently become known as the prudent man rule.¹⁰ This rule indicates that there is value when a "man of ordinary prudence would be justified in the further expenditure of his labor and means, with a reasonable prospect of success, in developing a valuable mine. . ." ¹¹ Although the language of *Castle v. Womble* makes no explicit mention of profitability, the Department of the Interior, in a long series of subsequent decisions, held that the prudent man would take into account prospective profitability before investing his labor and means.¹² The marketability test of value, as it came to be known, reached its final explication in *United States v. Coleman*,¹³ with the Secretary's decision that present marketability at a profit was required for discovery. Though the marketability test of value may be deemed desirable by the Secretary for unstated social purposes, it diverges significantly from the conventional economic test in which value is associated with positive market prices.¹⁴ For example, the title to low-grade copper deposits may be of substantial value to those willing to speculate on rising prices in the future or on the development of new techniques of extraction, yet the copper deposit may be highly unprofitable should it be mined today.

The use of mining claims for purposes other than mining has been extensive.¹⁵ Under the Mining Law of 1872 the owner of a mining claim has the right to disturb the surface in search for minerals, including such acts as cutting timber and erecting structures necessary for mining operations. In some cases summer homes have been built on otherwise worthless mining claims.¹⁶ The owners face the risk

9. 19 L.D. 455 (1894).

10. See Reeves, *The Origin and Development of the Rules of Discovery*, 8 Land and Water Review 1 (1973), for a discussion of the history of the rules and interpretations of discovery.

11. 19 L.D. 455, 457 (1894).

12. See Reeves *supra* Note 10, at 54, and also Strauss, *Rules, Adjudications, and Other Sources of Law in an Executive Department: Reflections on the Interior Department's Administration of the Mining Law*, 74 Colum. L. R. 1231 (1974).

13. 390 U.S. 599 (1968).

14. In an earlier era when land was abundant and other economic resources were scarce, it may have made sense as public policy to give away public lands to encourage their development. The trend toward stricter interpretations of the Mining Law may be viewed as recognition that granting mining patents primarily served to redistribute wealth and did little to stimulate mineral development and output.

15. One of the more egregious attempts to circumvent the intent of the Mining Law was the claim filed at the head of the Bright Angel Trail in the Grand Canyon for the purposes of extracting tolls from passersby, see *Cameron v. U.S.* 252 U.S. 450 (1920).

16. A thorough discussion of this abuse is given in Summer, *Wilderness and the Mining Law*, Living Wilderness, Spring, 1973, at 8.

that the Federal Government may challenge their claim on the grounds that valuable minerals have not been found. If the challenge is sustained the property reverts to government ownership. Others have filed mining claims on land in the path of urban growth (as in the thousands of claims for sand and gravel near Las Vegas) hoping to profit from use of the land as a commercial site.

Mining claims, though filed for a specific mineral, convey the right to remove other minerals. As relative mineral values change, old claims may be challenged in state courts by those who would like to obtain mining rights for other minerals. The challenge may be on the grounds that the boundaries of the original claim were incorrectly specified, that less than the requisite \$100 effort has been done yearly, that the valuable discovery has not been made, and a host of other points.

The discovery procedure frequently serves to retard the production of minerals. The area surrounding the site of a major discovery usually becomes dotted with other speculative claims which may hinder further development. Not only is it expensive to negotiate with so many different claimants, but each one has an incentive to hold out for a disproportionate share of anticipated future profits. Dormant mining claims serve as a deterrent to new exploration because of the significant costs of having them declared invalid.

Development of a mining property involves capital requirements on a scale which normally requires access to financial markets. Because of risk reduction through diversification of activities, the larger mining companies are able to obtain financing on more favorable terms than would the lone prospector. Capital requirements force the owners of any undeveloped mining claims to solicit offers from the major mining companies if the properties are ever to reach the producing stage. The larger mining companies have obtained much of their producing property in this fashion.¹⁷

Prospecting on closed (private) land differs from that on public open access land in that some bonus, lease, or royalty is normally arranged before prospecting begins. The landlord captures some of the rent and prospecting is less motivated. Another factor which tends to limit exploration on private lands is that the rational landowner would want to postpone exploration effort in the hope that exploration on adjoining properties would reveal information as to the mineral content of his property.

A third land tenure arrangement has evolved on former public

17. The Vice President of Anaconda reported that of their mines in current production only one had been discovered by Anaconda. See *Hearings, supra* note 4, at 272-73.

domain lands where surface rights have been disposed of through statute. The separation of surface and mineral rights on these lands has led to a number of unfortunate situations where mineral exploration and even mining occurs in residential areas.

Factors other than the General Mining Law which affect industry decisions on the timing of and investment in exploration include the nature of competition in the industry and Federal and state tax policy toward the mineral industry. The industry setting of imperfect competition serves to stimulate preclusive preemption to the industry base to strengthen competitive positions. Firms place a high value on the discovery of resources because they may later be rewarded by monopoly rents. Vertically integrated firms often attempt to gain control of raw material supplies. Mancke observed this tendency in the steel industry in the late nineteenth century. The apparent motivation of the steel producers was to prevent the formation of an iron ore cartel that might threaten the profitability enjoyed by the steel industry.¹⁸

Federal tax policy appears to operate to stimulate exploration, though a comprehensive review of the effects is beyond the scope of this paper. On balance the expensing of exploration and development expenditures serves as an interest-free loan from the treasury in the amount of the deductions, when one compares this policy with the alternative of treating such outlays as investments. Though Miller has argued that percent depletion discourages exploration, it would appear that by making mineral discoveries more valuable, percent depletion would serve to stimulate exploration effort.¹⁹

The effect of the property tax on exploration deserves special consideration. Mining claims are not subject to a property tax until they are patented. Minerals can be removed from unpatented claims, making the impact of property taxes on exploratory efforts on open public lands minimal. On private lands property taxes may be revised upward following mineral discovery. This factor may serve to reduce the incentive to explore. The administration of property taxes is an extraordinarily complex subject involving thousands of rates, districts, and administrative decisions. Any impact of property taxes on exploration efforts could be minimized by reducing taxes on properties where mineral production is uneconomic, while raising it in successful properties.

18. R. Mancke. *The American Iron Ore and Steel Industries: Two Essays* (1969, unpublished dissertation at M.I.T.).

19. See Miller, *Percent Depletion and the Level of Domestic Mineral Production*, 15 *Nat. Res. J.* 241, 253 (1975).

ECONOMIC CONSIDERATIONS FOR OPTIMIZATION IN EXPLORATION

There are two basic tests of the social desirability of the discovery process. First, is exploration effort timed in a manner that is consistent with national policy objectives? Second, are inputs to the discovery process used efficiently? Because there is little, if any, governmental regulation or other form of influence on the timing of exploration, there may be a divergence between decisions made by the mining industry and national policy objectives. The legal setting of open access favors the inefficient use of exploration inputs; in addition, the decentralized and often lax recording of claims needlessly increases discovery costs.

That exploration should precede production by many years is suggested by information requirements regarding the quality and extent of domestic ore supplies which would be an input to the development of a national materials policy. Additionally, if the commencement of production is to be optimally timed, the values of all mineral leases and claims should be accurately known. This is difficult in the face of the tremendous uncertainty which precedes thorough exploration. Certainly the reticence of the mining industry to reveal the true extent of propable reserves compounds the difficulty of making Federal mineral policies. A factor which argues against complete knowledge of reserves is that idle reserves in and of themselves are not productive. If social welfare is to be measured strictly by output, society would be better off to defer exploration outlays until just before production is scheduled to begin, and channel investment funds into productive areas in the interim. Moreover, as technological improvement in exploration continues, the real costs of discovery should decline, further arguing for a slowing of the pace of exploration. As long as the timing of exploration is controlled by mining firms rather than subject to some form of central control, there is a strong chance timing will be premature from the viewpoint of society as a whole. Rather than being motivated by national policy objectives the individual firms are stimulated to explore by profit-maximizing considerations. Individual profit-maximizing behavior fails to maximize societal welfare both when the rate at which future profits are discounted by individuals differs from the social rate of discount, and when individuals are induced to explore in order to strengthen market positions.

The second question to consider is efficiency in exploration. In theory, and ignoring considerations of risk, inputs to any production process should continue to be hired so long as the value of their

marginal product continues to exceed their cost. For mineral exploration there is no central authority with the responsibility for determining the marginal productivity of additional prospecting effort. Individuals are guided in their decision to prospect by the expected (average) wage in the industry (or may be willing to accept even less if they are attracted by the remote prospect of a big strike). Assuming diminishing returns to prospectors as a result of a decline in the quality of lands being searched, the average wage will exceed the incremental value of the contribution to total discovery value made by the last few prospectors.²⁰ These marginal prospectors, though themselves earning the average wage, depress the incomes of the earlier entrants to the field, so that in terms of their net contribution to discoveries their effort is unjustified.²¹ Again individual profit-maximizing decisions lead to a lower level of social welfare than would occur under centralized management of exploration.

Although we have in principle answered the question of the optimal amount of prospecting effort, there exist a number of possible externalities which could alter the conditions for optimality. They include:

- (1) An information externality in that one discovery may make it easier to find minerals in the same or similar geological formations.
- (2) An exploration externality resulting from duplication of effort—searching the same land more than once.

In commenting on these externalities we note that a beneficial externality, such as the first, would require the optimal exploration effort to be greater than indicated by the marginal productivity criterion, whereas a negative externality, such as the second, would indicate the criterion calls for excessive exploration. The third externality deserves special consideration. It is true that each successive discovery raises the cost of subsequent discoveries, especially in the absence of externalities of the first type. If one views exploration as a sequential searching process, identical prospecting efforts in successive years will be expected to yield progressively lower returns. This is merely the famous pecuniary externality where firms face a rising supply curve for an input (mineral reserves) and

20. As Worcester has noted, a price of zero on one input (unclaimed mineral deposits in this case) creates a technological externality in that prospecting efforts expand beyond the point where the marginal product of labor is zero. In equilibrium the average returns to prospecting are just sufficient to keep firms in the industry. See Worcester, *Pecuniary and Technological Externality, Factor Rents, and Social Cost*, 59 Am. Econ. Rev. 875 (1969).

21. This point has been made in F. Peterson, *Two Externalities in Petroleum Exploration*, Studies in Energy Tax Policy (Brannon ed. 1975) and in W. Schulze, *The Optimal Use of Non-Renewable Resources: The Theory of Extraction*, 1 J. Env. Econ. Mgt. 53 (1974).

appropriation of the input by one firm raises the cost to subsequent users. As such it does not result in a misallocation of resources and calls for no deviation from the optimality criterion.

ECONOMIC CONSIDERATIONS FOR OPTIMIZATION IN PRODUCTION

In theory (and probably in practice) the production of minerals by corporations is governed by the maximization of the present value of profits from a mine.²² Thus production decisions are affected by profitability variables such as taxation, ore grade, mineral prices, and extraction technology, all of which are factors unrelated to the operation of the General Mining Law. The primary, if not the only, function of the General Mining Law is control over the process by which the ownership of minerals in place is transferred from public to private hands. As argued below, the neutrality of the Mining Law with respect to production decisions permits the attainment of the same social welfare optimum that would result from the unrestricted activities of individual mining companies. Most recent proposals to revise the Mining Law would affect production decisions, either through taxation, royalties on leaseholds, or requirements that production commence within a stated period to maintain rights to a leasehold. This section examines the impact of taxation and other regulatory mechanisms on the production decisions of mining firms as a prelude to the critical evaluation of the proposals to revise the Mining Law.

Maximization of the present value of producer's plus consumer's surplus will be used as the criterion of optimality in production. This choice may appear a bit artificial, but it has been used previously in intertemporal models, and as Peterson shows, it is equivalent to efficiency in the more conventional terms of price and marginal cost.²³ Hotelling first demonstrated the efficiency of a competitive mining industry.²⁴ He showed that a competitive industry which

22. In a qualitative discussion of mineral conservation, Montgomery has suggested that the maximization of private economic returns is too narrow a criterion of optimality. He argues that present recovery techniques are often needlessly wasteful and that society ought to consider mineral recovery techniques along with other social, economic, and environmental benefits in making decisions regarding mineral production. See Montgomery, *Conservation in Mineral Development: Why Be Concerned?* Thirty-Ninth N. Am. Wildlife and Nat. Res. Conf., (1974).

23. F. Peterson, *The Theory of Exhaustible Natural Resources: A Classical Variational Approach* (1972, unpublished dissertation at Princeton Univ.).

24. H. Hotelling, *The Economics of Exhaustible Resources*, 39 J. of Pol. Econ. 137 (1931). It should be noted that Hotelling wrote long before technological externalities became a fashionable subject for inquiry, and he did not incorporate them into his model. With such externalities the result no longer holds; a competitive mining industry fails to achieve optimality.

maximizes the present value of profits chooses exactly the same production path as a centrally planned economy which maximizes the present value of producer's plus consumer's surplus. A monopolistically controlled industry would fail to achieve optimality by maintaining a difference between price and marginal cost. Compared with the centrally planned economy's production path the monopolist restricts output.

In the competitive model firms maximize the present value of profits, which is the present value of producer's surplus (the difference between price and long-run marginal cost), and may properly be termed economic rent when marginal cost measures the opportunity cost of each input. Economists have long argued that taxation of rent is socially desirable, such taxes being non-distorting. Additionally one might argue that mineral production on public lands should not earn long-run profits above the minimum necessary to attract the investment that does take place. Equity with respect to the allocation of public resources would indicate that some (the mining companies) should not benefit at the expense of the many.

We are led to an examination of the effect of various forms of taxation on the allocation of rents and on the optimal timing of production. Hotelling and Peterson both analyzed the impact of taxation on production. Their results are summarized below. A pure profits tax is a tax on economic rents; it does not distort the timing of production from that which is socially optimal. The income tax distorts production decisions because of the manner in which investment is treated. Rather than being written off as incurred, investment for exploration and development of productive ventures must be capitalized and depreciated over time. The depletion allowance as it is written in the tax code serves to accelerate the timing of production over what it would be with ordinary income taxation. In recent sessions of Congress hearings have been held on legislation that would impose a Federal severance tax or royalty payment on output. A severance tax would have the consequence of postponing output and would also serve to transfer some of the economic rent to the Federal government.

Tax	Effect on Timing of Production
pure profits	neutral
income	delayed
severance	delayed
property	advance or neutral

Taxes such as royalties and severance taxes serve to lessen the differential in value between the use of land for mineral production and some alternative purpose, even if the alternative use is merely to serve the needs of an occasional hiker or hunter. As long as the land continues to be used for mineral production the government obtains a share of the rent that previously accrued to the owner of the land. By applying royalties or severances to the gross value of output, the extensive margin of land use for mineral production will be curtailed.²⁵ A tax on net receipts (accounting profits) would be better in that more profitable operations would pay larger taxes per ton of ore removed, but better still would be a tax on pure economic profit (rent). In theory this would be administered by taxing only that portion of profits from each operation above that which reflects a normal rate of return on the investment (properly adjusted for risk).

REVISING THE MINING LAW OF 1872

Significant modification of the General Mining Law occurred with the enactment of the Mineral Leasing Acts of 1920 and 1947²⁶ and the Material Disposal Law of 1947.²⁷ The former served to exclude most energy minerals from location through the Mining Law, and the latter provided for the sale of common materials such as sand, gravel, and clay obtained on public lands at fair market value. The wisdom of having three separate systems for the development of minerals on Federal lands is questionable, especially considering that the minerals subject to disposal under different systems may be intermingled in the same deposit. The Multiple Mineral Development Act²⁸ was an explicit attempt to deal with this problem of administration. The passage of the National Wilderness Areas Preservation Act²⁹ and the establishment of the Public Land Law Review Commission³⁰ presaged a revival of interest in an examination of the desirability of the Mining Law as an instrument of national policy.

Most of the land that was placed in wilderness status by the National Wilderness Areas Preservation Act had been open to mining and in many areas claims had been filed and even patented. Rather than halt all current mining efforts or deny rights that had already been conferred through patenting, Congress opted to allow prospect-

25. This point is repeatedly made in the testimony of various mining associations. David Cole, Secretary of the Colorado Mining Association, in *Hearings, supra* note 4, at 280, asserts that a royalty is counterproductive because it increases the cutoff grade.

26. 30 U.S.C. §181 (1970); and 30 U.S.C. §§351-90 (1970).

27. 61 Stat. 681, *supra* note 7.

28. 30 U.S.C. §§521-31 (1970).

29. 16 U.S.C. §§1131-36 (1970).

30. 43 U.S.C. §1392 (1970).

ing and mining until January 1, 1984, presumably a sufficient time to allow fixed investments to be recovered. The Act specifies that it is Federal policy "to secure for the American people of present and future generations the benefits of an enduring resource of wilderness."³¹

The act establishing the Public Land Law Review Commission states:

[I]t is hereby declared to be the policy of Congress that the public lands of the United States shall be (a) retained and managed, or (b) disposed of, all in a manner to provide the maximum benefit for the general public.³²

By this declaration Congress reinforced the trend away from what some have viewed as indiscriminate disposal of Federal lands under such laws as the Homestead Law³³ and the General Mining Law. As land became more scarce, disposal as an instrument of public policy gave way to leasing and sale through competitive bidding. The open access to minerals on public lands is one of the few remaining vestiges of our former national policy.

The Mineral Leasing Act of 1920 excluded most energy minerals from location and provided for the awarding of lease privileges through competitive bidding. By leasing, rather than allowing open access, the dissipation of economic rent through excessive and premature exploration can be eliminated. Presumably the Interior Department can weigh the social benefits from alternative uses of Federal lands before it decides to offer them for lease. Also the regulation of mining activity is simplified if tracts are large and records of ownership are kept in a single location. The welfare of future generations may or may not be factored into governmental decisions, but at least there is reason to believe it will be given more weight than in private decisions to explore when open access is allowed. Uncertainties associated with possible withdrawal of exploration rights still exist as a deterrent to prospecting effort and may serve to adversely affect bidding for oil and gas leases.

The principal defect of the Mineral Leasing Act of 1920, from the viewpoint of economic efficiency, is the manner in which production leases are awarded for lands not known to be mineralized. The Act specifies that parties interested in obtaining a noncompetitive oil or gas lease must file simultaneously, the winner to be chosen in a random drawing. Typically, parties awarded the leases are not in the petroleum industry and sell the lease to one of the major petroleum

31. 16 U.S.C. § 1131(a) (1970).

32. 43 U.S.C. § 1391 (1970).

33. 43 U.S.C. §§ 161 *et seq.* (1970).

companies in a contract that provides for a royalty to the seller. No part of this royalty accrues to the Federal government (other than through income taxation.) This system encourages excessive investment in the socially nonproductive act of filing for the leases. Social welfare would be increased if this nonproductive effort was discouraged and a system of competitive bidding established (as is done for lands known to be mineralized).

The leasing process for coal and phosphates requires that they often be granted without competition, a system that may, depending upon leasing fees, transfer economic rent from the Federal government to private investors.

At least four bills were introduced recently in Congress that would modify the operation of the Mining Law of 1872 as it pertains to hardrock minerals. These are S 1040, the proposed "Mineral Leasing Act of 1973;" S 3085, the proposed "Hardrock Mineral Development Act of 1974," S 3086, the proposed "Mineral Development Act of 1974;" and HR 8435, the proposed "Mineral Leasing Act of 1975." The following paragraphs outline the provisions of each of these bills and analyze their efficacy in producing socially desirable changes in the Mining Law.

S 1040, which was supported by the Administration and the Interior Department and strongly opposed by the organized mining interests, would have repealed the Mining Law of 1872, the Mineral Leasing Act of 1920, and related laws, and in their place would have:

- (1) Instituted a system of leasing for the exploration of all minerals. The leases would have been issued by competitive bid only when there was evidence of minerals in paying quantities; otherwise leases would have been issued without charge, and would have been valid for a period of ten years.
- (2) Instituted a second type of lease for production, valid for from five to twenty years and automatically renewable if minerals were being produced.
- (3) Established minimum annual rental fees per acre on all leases.
- (4) Established a minimum royalty on production.
- (5) Required submission of plans for operation and reclamation prior to commencement of mining, and compliance with these plans throughout.
- (6) Given the Secretary of the Interior the authority to remove lands from the operation of the Act to protect the environment or to promote alternative uses of the land, and also given the Secretary the right to waive or reduce fees and royalties on certain properties to encourage development.
- (7) Limited hardrock mineral leaseholdings under control of

one corporation to 20,480 acres in one state and 640 acres in one lease.

(8) Required that all existing claims be recorded within one year of enactment of the Act and a patent applied for within three years.

If properly implemented by the Secretary of the Interior, this bill would have corrected the major objections previously raised to the Mining Law of 1872. Timing of exploration would have been under centralized management, and with restrictions on entry there would have been far less of an incentive to excessive exploration effort. With entry restrictions on a lease, decentralized prospecting decisions are (theoretically, at least) guided by a prospector's marginal product, a force that should lead to efficient use of prospecting inputs. Uncertainties over ownership would have been resolved. Larger leases should eliminate the externalities associated with excessive adjacent claim filing near productive discoveries. Control over use and the evaluation of alternative land uses would have rested with the Secretary, who presumably would make decisions consistent with the maximization of social welfare.

Contrary to the remarks of Howard Edwards of the Anaconda Company that offering leases through competitive bidding, as proposed by this bill, ". . . is not a fair way to allocate leases because the practice discriminates against small miners, is an economic waste, discourages development and investment . . ." ³⁴, the taxation of true economic rent (as in a bid for a lease) is desirable because it serves to allocate investment according to the marginal productivity criterion. It is true that bidding for leases can involve substantial sums and this factor would definitely serve to deter the small prospector. In the past the small prospector has been instrumental in the discovery process; Koehler Stout, President of the Montana Mining Congress, terms them the "bird dogs" of the industry. ³⁵ If their efforts truly are more productive than similar outlays by large mining companies, the interests of both prospectors and mining companies would be served by formalizing their relationship in an employment contract (containing suitable incentives for discovery).

The Hardrock Mineral Development Act of 1974, S 3085, is similar to S 1040 with the following exceptions:

- (1) It would have applied only to hardrock minerals.
- (2) It did not specify guidelines for competitive bidding on leases.

34. Hearings, *supra* note 4, at 268.

35. *Id.*, at 286.

- (3) It did not specify that the Secretary would have discretion over the issuance of exploration leases.
- (4) Production leases could have been held for 40 years without any production as compared to 20 years under S 1040.

The differences between S 3085 and S 1040 were primarily in the scope of coverage and the authority vested in the Secretary. The economic implications are clear. Inefficiencies in other than hardrock mineral exploration and production would not necessarily be subject to evaluation by a centralized decisionmaking unit. Also the absence of competitive bidding for leases would result in a loss of economic rent to society and its appropriation by the winner of the lease.

The proposed Mineral Development Act of 1974, S 3086, was preferred by the American Mining Congress, an association of large mining companies, and was opposed by (1) various smaller associations representing lesser mining companies for whom capital requirements would have been burdensome, and (2) the Department of the Interior. Among other things this Act would have:

- (1) Provided for the elimination of existing unpatented claims unless a new claim was filed within five years of the date of enactment of the Act.
- (2) Had new claims recorded both in the county recording office and in the regional office of the Bureau of Land Management, and filed for 80 acres in a manner that conforms with legal subdivisions of public land.
- (3) Eliminated the present distinction between lode and placer claims.
- (4) Increased the annual labor requirements substantially.
- (5) Continued the present system of patenting, though only at a substantially higher fee. Patents would have only conferred the right to extract minerals and would not have allowed full freedom to utilize the site for other purposes as is the case under present law.
- (6) Instituted a system of royalties of 2% of the value of minerals mined subject to the restriction the royalty be less than 5% of net income.

This bill would have resolved many of the ambiguities over ownership by eliminating all old claims for which there was no current active interest. By collecting all claim information in a central repository (BLM), potential claimants should enjoy significantly lower search costs in determining whether or not a given parcel has been claimed. Presumably the provisions restricting use of patented sites to only those directly connected with the production of minerals would have eliminated the abuses that have occurred on these sites.

The provisions for environmental protection in these bills differed substantially in degree. S 1040 would have had the most stringent requirements, the operation and reclamation plans which would have had to have been approved before development and followed thereafter. S 3085 would have been less restrictive by not requiring such comprehensive planning, nor would it specifically have vested authority in the Secretary to reject the issuance of exploration leases or bids for leases when he felt it was in the public interest to do so, as he could under S 1040. S 3086 would have given the Secretary even less authority to deal with problems of multiple use and environmental damage.

HR 8435, the proposed Mineral Leasing Act of 1975, was drafted largely by Lawrence MacDonald, a Colorado School of Mines professor of economics. This bill would revise the entire system for mineral disposal including hardrock minerals, oil and gas, construction materials, and bedded minerals such as oil shale and sulfur. The existing systems would be replaced by a three-stage leasing system in which the Federal government would retain ownership and control over the land. Strong environmental safeguards would accompany each stage. Inasmuch as the principal concern of this paper is hardrock mineral development under the General Mining Law, the discussion of HR 8435 will deal primarily with the regulation of hardrock mineral development.

In stage one the Secretary of the Interior would, at his discretion, issue a prospecting permit allowing only surface reconnaissance to any person making a valid application. Each permit would be valid for a period of two years and would be subject to a nominal fee to cover administrative costs.

In stage two exploration leases would be issued which would give exclusive exploration rights to the leaseholder. Where two or more persons file exploration applications on substantially overlapping territory, the Secretary would offer the lease competitively to the highest bidder. A rental fee of at least 50¢ per acre per year would be charged; the size of each lease would be limited to a maximum of 640 acres; and the extraction of minerals would be limited to quantities required for chemical analysis.

In the third stage a development and production lease would be issued by the Secretary to persons showing that deposits exist in paying quantities. Lease applications would be able to be revised to include other minerals should they be discovered during subsequent development. Leases would be issued for a twenty-year term and continue thereafter as long as production continued. A fee of at least \$1 per acre per year would be imposed and the fee would be

increased each year following the sixth if production had not commenced. Before extraction operations could begin a comprehensive plan for operations and reclamation would have to be approved by the Secretary.

Holders of existing mining claims would be forced to record them within one year of the date of the Act, and to file an application for a patent or a development lease within three years of recordation of the claim.

HR 8435 would eliminate most of the undesirable features of discovery under the General Mining Law. Furthermore, the imposition of strong environmental controls in an area so conspicuously lacking in controls must be viewed favorably. Despite these desirable features, distortions in the intertemporal allocation of resources could result from the pressure that would be placed on prospectors to bring mines on stream at an early date.

A rational mining firm maximizing the present value of its profits would begin development of a deposit when the return earned on holding the undeveloped deposit just equalled the return available on alternative investments—that is, when the rate of increase in value of a deposit equals the market rate of interest. As Hotelling showed, the profit-maximizing activities of a competitive mining industry would maximize societal welfare. When a regulatory system is instituted which imposes penalties for delaying development, the mining firms having development and production leases on marginally valuable deposits are forced to accelerate the timing of production if they want to avoid losing their rights under the lease. Such penalty provisions may indeed stimulate mining activity in the near future, but only at the cost of denying these minerals to future generations. The production incentives are undesirable because they would distort what are, in principle, decisions consistent with the maximization of social welfare.

CONCLUSION

The mineral discovery process on open Federal lands has been shown to suffer from a number of defects, the severity of which has not been assessed. It would appear that a strong, plausible argument can be made that centralized management or control over mineral exploration is desirable, from the viewpoints of both efficiency and control over the timing of prospecting effort. If national mineral policy is to continue to allow open access, we must ask who benefits from such a policy, and what is it costing the nation. Open access is essentially a form of public subsidization of prospecting. Prospectors

receive revenues that would accrue to the Federal treasury in a leasing system. Although it may well be deemed appropriate to publicly subsidize exploration, open access is a poor mechanism through which to transmit this subsidy. Because the inefficient use of common property resources is a familiar and ubiquitous occurrence, subsidies such as governmental sponsorship of seismic surveys, assays of the mineralization of aquifers, and research on mining and milling technology, combined with a system of leasing, would favor efficient use of scarce resources, and thus be preferable to the discovery system with open access.

A second form of inefficiency in the claim-filing process creates uncertainty over the existence and authenticity of claims, needlessly raising the cost of exploration. That such a policy wastes resources has been recognized by the mining industry and is reflected in its enthusiastic support of proposals to eliminate all claims for which there is no current active interest.

Inasmuch as all of the bills that were reviewed here contain a provision for taxation, it appears that governmental policy makers favor, and the mining industry is willing to accede to, some accrual of rents to the Federal treasury. Unfortunately that tax provision in each of the bills is nearly identical in basing royalties or severance taxes on the value of gross output rather than on economic rent. Such taxes are distorting in that they affect both investment and production decisions. Perhaps in the broader context of conserving minerals for the use of future generations, a severance tax could be justified, but even then taxation of economic rents would be desirable.

Although a compelling case for a revision of Federal mineral policy can be made on both allocative (efficiency) and distributional (equity) grounds, the actual gains, if any, from such policy changes are unknown. The growing tendency for exploration to be conducted by larger firms lessens the chance of externalities due to needless duplication of effort. The fact that only eleven patents were issued in 1973 certainly indicates that exploration activity is probably not as intense as it once was. It is possible that the costs of administering a leasing system would outweigh any gains achieved through the efficient allocation of inputs to exploration. Based on existing evidence it would be foolhardy to predict which of the proposed revisions would be the best public policy. Furthermore an interesting alternative—public management of all exploration, with sale at competitive bidding of leases to promising discoveries—may in fact be preferable to any of the current proposals. We would suggest that more thorough research on the above issues may be the best public policy over the near term.