

# TWO CHEERS FOR THE 1872 MINING LAW

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Executive Summary

Metal mining on federal lands is governed by an 1872 law. Critics argue that the law "gives away" valuable assets at prices well below market value, often for uses other than mining, and does not allow the government to conserve mineral resources through public ownership.

Estimates of the "giveaway" are vastly overstated because of the failure to use conventional financial methodology; any "giveaway" occurred long ago and is not ongoing. The "fraudulent" use of land for nonmining purposes is simply the result of unwise restrictions on land uses that are more profitable than mining. The need to conserve exhaustible resources is a red herring. No exhaustible resource industry has vanished because of the exhaustion of supply, but many renewable resources have vanished for that reason.

The U.S. government owns land because many Americans believe that land markets and extractive activities, like mining, do not operate well unless they are publicly owned and subject to scrutiny very different from that received by supermarkets. We would never accept public ownership as a solution to whatever market failures existed in food markets. We also should not accept public ownership in land markets.

Future mining claims should be allocated at auction without royalties, but existing claims should remain unaltered. A second-best alternative would be to allow anyone to bid against mining companies under the current mining law regime. If both of those options remain closed because of political considerations, then the 1872 Mining Law should be left alone.

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Introduction

Many laws affect public land administration as a general matter, but separate laws govern the commercial exploitation of energy and mineral resources. The laws that govern commercial use of energy resources, such as crude oil, natural gas, and coal, reflect the belief that the federal government should retain ownership of the public estate and that commercial access to that land ought to be on a rental, rather than an ownership, basis.

Metal mining is the exception. It is still governed by laws that were enacted in 1866 and 1872.<sup>(1)</sup> Those laws allow individuals to lease or own land that contains valuable minerals. Other laws have closed land to mining or given the secretary of the interior discretion to propose exclusions. However, for the minerals still governed by the 1872 law, the rules have changed very little over the past 125 years.

The Mining Law of 1872 allows U.S. citizens to claim land for mining purposes in units of 20 acres as long as \$100 per year is spent on the land. The law also permits U.S. citizens to convert their claim to ownership of the land for \$2.50 an acre.

From that simple regime numerous complications arise. First, the government must decide whether the claimant is the

first discoverer of a valuable mining deposit, but the determination of first discovery and the value of the mineral deposits is difficult.(2) Of course, the main complaint about the current regime is about the fees paid to exploit minerals found on public land; those fees are attacked by critics as hopelessly outdated, given subsequent inflation. Such challenges implicitly assume both that minimum charges are desirable and that government should monitor development. Although most Americans continue to believe that government should not as a general matter dictate how (or at what pace) specific tracts of land are used or developed, policymakers consider mining lands an exception to that rule.

The bill of particulars marshaled by critics of the law is well-known:

- The mining industry is acquiring valuable real estate at prices well below market value, and thus the law is an example of "corporate welfare."(3)

- The low annual work requirement (\$100) allows large tracts of land to be held in inventory rather than actually used for mining, which promotes speculation and inefficient land use.(4)

- Mining claims are often used as a subterfuge to secure land for other uses such as real estate developments, a practice that both subverts the public interest in minerals production and enriches private parties at the public's expense.(5)

Critics of the 1872 Mining Law focus on the fact that it has not been changed for 125 years rather than on the narrowing of its applicability. Starting with the 1920 Mineral Leasing Act,(6) Congress initiated what was to become the standard policy of extending access on a rental rather than an ownership basis. The 1920 act established leasing as the means of access to fossil fuels (oil, gas, and coal) and fertilizer minerals. Later Congresses also modified the mining law to prevent the transfer of land obtained for mining purposes. For example, a 1955 law(7) excluded sand, gravel, cinders, and other common materials from coverage under the mining laws because claims to federal land around some western cities, particularly Las Vegas, were obtained under the 1872 Mining Law and quickly converted to commercial and residential real estate.(8)

In the 105th Congress (1997-98) the struggle over mining law reform continues.(9) Several bills had been introduced but not enacted as of February 1998. Sen. Dale Bumpers (D-Ark.), a long-time proponent of changes in land law that require payments to the federal government, and Reps. Nick Rahall (D-W.Va.) and George Miller (D-Calif.) have introduced bills that would impose a 5 percent royalty on gross income minus processing costs (also called net smelter income) from mineral production on federal land, add a progressive net profits tax on private mines that were privatized under the patent provisions of the 1872 law, and terminate the right of citizens to purchase federal land used for mining.(10) The federal government would retain ownership in perpetuity. Finally, the bills would impose federal reclamation standards on hardrock mines for the first time.

Sens. Larry Craig (R-Idaho) and Harry Reid (D-Nev.) have introduced the Mining Reform Act of 1997 (S. 1102), which is supported by the National Mining Association. The bill would alter the sale of patents of mining land to require payment of "fair market value" rather than \$2.50 an acre (sec. 204). The fair market value, however, would apply only to the land exclusive of any minerals. In addition, the federal government would charge a 5 percent royalty on the net proceeds from mining on all unpatented mining claims and all mining claims patented after enactment (sec. 401). The federal government also would allow states to enforce the relevant environmental regulations if the states requested to do so (sec. 307).

Unfortunately, the debate over reform of the 1872 Mining Law pits largely defective attacks against generally incomplete defenses. Critics of the current law use an egregiously inaccurate methodology to conclude that the "economic giveaway" is quite large. What critics call abuses are simply efficient economic responses to bad laws. The environmental impacts of mining, moreover, are dramatically overstated. Opponents of reform are unfortunately content to accept public ownership of the mineral estate, a regime that inevitably politicizes economic decisionmaking and introduces all of the complications inherent in socialized enterprises.

Defenders of the current regime also argue that valuable mineral deposits are unique and rare. Thus, they believe that a law prohibiting alternative uses of mining land is the best policy. That argument, in turn, has two important implicit premises, one of which is valid and vital, and the other of which is wrong. The valid premise is that the government must adopt simple rules because it cannot handle complexities.(11) The invalid proposition is that government should, nevertheless, control private decisions about how land is used.

The first two sections of this study examine the most common criticisms of the 1872 Mining Law: that it is a subsidy to mining interests and that "waste, fraud, and abuse" are rampant. The third section considers the prescriptions offered by the critics to remedy those problems. The final section makes the case for invigorating the best parts of the law by making more muscular its land-disposal orientation. In sum, we find the law worthy of "two cheers"; the criticisms leveled against it are largely ill-considered. It would be worthy of a third cheer were it a more robust engine of unbiased privatization.

#### The Absolute and Final Word on the Mining Fee

Since the early years of the Republic, a critical aspect of the public lands debate has been a largely pernicious preoccupation with payments to the Treasury. The federal government, for example, vigorously promoted the imposition of fees for grants of farmland but eventually abandoned the effort in the face of massive opposition.(12) Even when fees are levied, complaints that actual payments are unsatisfactory are never far from the political surface. Those complaints are particularly strong in connection with the 1872 Mining Law because the extraction of valuable minerals on federal land takes place with minimal payments to the Treasury.

What the debate is really about is the distribution of wealth. Critics of the 1872 Mining Law contend that the profits generated by mining federal lands are huge and that they belong to the taxpayers, not the private mining industry. The evidence is largely anecdotes about how little is paid to the federal government for land that yields tremendous mineral revenue. Typical was an April 9, 1997, NBC "Fleecing of America" segment on the Nightly News with Tom Brokaw that used as an example a parcel of land in California that contained \$266 million in gold but was sold for only \$1,725.

Even the most casual analysis, however, finds that the quest to transfer natural resource rents from mining companies to taxpayers is not worth the populist attention given the issue by the media. The mining profits generated from that land--to the extent that they exist--are absolutely trivial.

Critics of the present claim fee err in three important ways. First, they ignore the speculative nature of mining claims when they retrospectively examine land sales and asset values. Second, their calculation of profits from mining federal land is wildly inflated. And finally, they ignore the existence of secondary markets for federal land claims as well as the dissipation of "subsidy" that occurs through nonmarket competition for rents. When those factors are accounted for, one is hard-pressed to identify any "subsidy" of consequence.

#### Retrospective Examination of Asset Values

The first error made by critics of the mining fee is their practice of obsessing over how little the federal government receives for the mining land relative to its later market value. At first glance, \$2.50 per acre does seem underpriced. But before we can determine whether that fee is too low, we need to understand how individuals determine an asset's value in a market economy.

If the advantages that flow from ownership of an asset are certain, people will pay the present value of the flow of future benefits using a risk-free interest rate, such as the return on U.S. Treasury notes. If an asset's benefits are uncertain (or the time at which the benefits will end is uncertain), then the discount rate used in the present value calculation is much higher than the risk-free rate. In most situations, the future benefits from assets are uncertain as to both size and timing, and, thus, the discount of those benefits creates prices that are low relative to the price of an asset the returns on which are certain.

Some assets initially clouded by uncertainty turn out to perform very well. If one examines only the subset of "good performers" from the universe of initially uncertain assets, one will always conclude that the purchaser of the asset was advantaged. A 1989 General Accounting Office study of lands patented under the 1872 Mining Law used that style of analysis when it noted that

our review of 20 patents issued since 1970 showed that the federal government received less than \$4,500 for lands valued in 1988 at between \$13.8 million and \$47.9 million. . . . Patent holders sold 17,000 acres of oil shale land to major oil companies for \$37 million. Just weeks earlier they had patented the land and paid the government \$42,500.(13)

The fallacy of such thinking, of course, is that it ignores the subset of "bad performers" that may form a large percentage

of the original universe of initially uncertain assets.(14)

An examination of all assets, including those that do not perform well subsequent to the start of the analysis, leads to the conclusion that in markets with many participants, risk-adjusted excess profits on assets are zero.(15) Some of the assets surrounded by uncertainty will make large profits, but others will have been bad bets and will prove nearly worthless. If bids were gathered for all assets, the total bids would equal the present value of the excess profits. However, that need not be true for any one asset. The bid for a property that proves highly profitable may have been far lower than the present value of the land, but that is offset by payments in excess of the present value of the land for less successful ventures. On average, the returns are normal, but they are not necessarily normal for any particular asset.

The relevant policy question in the case of the 1872 Mining Law, however, is whether the price of zero (free access), or \$2.50 per acre if the land is purchased, for a ticket to the "mineral claim" lottery deviated substantially from the expected value of the winnings. The fact that some of the mineral claims subsequently became very valuable does not necessarily imply that the market price for the "lottery tickets" that gave rights to such claims would have been much greater than zero.

#### Gross Errors in the "Giveaway" Calculations

The second error critics of the mining fee make is their complete misunderstanding of how valuable mining land is to the nation as a whole and the mining industry in particular. Critics routinely point to the staggering sums that have supposedly been "given away" to corporations under the aegis of the 1872 law. Some perspective, however, is necessary.

First of all, profits derived from land are not a large part of national income. Most estimates are around 6 percent of national income, or \$372 billion in 1994 (approximately \$1,400 per capita).(16) Only a tiny fraction of that amount could possibly come from mining activity on public lands. If 1 percent of land rents was derived from such land, the amount would be \$14 per capita.

Nevertheless, for several years the Mineral Policy Center has campaigned against an alleged \$231 billion giveaway of public lands claimed for metal mining. Their estimate is widely referenced by politicians, in leading newspapers, and on television.(17)

Even by the low standards of populist crusades, however, the MPC's work is severely flawed. That is evident from interpreting and checking the data from the position paper that presents the numbers.(18) The exaggeration involves both using an inappropriate measure of the worth of mineral land and language that seems deliberately designed to mislead.

The \$231 billion figure is actually an estimate of the cumulative market value (in 1994 prices) of all metals produced from federal land since the operative law was passed in 1872. While the MPC is vague about the methodology used to calculate the estimate, enough information is provided to convince us that our interpretation is correct.(19)

The MPC goes even further astray by relying on "'gross' value, meaning [the value of the mineral reserve] excluding extraction, processing, and marketing costs."(20) That statement, at best, involves a strange definition of "excluding." The usual concept of "gross" is revenues before deducting (which most people would consider to mean including) costs. The report clearly uses projected receipts without deducting projected costs and invalidly uses those values as a measure of the giveaway. To make matters worse, the report makes the mistake of calling those gross values the worth of the minerals in the ground or "taxpayer loss."(21)

Mining, however, is no more a free lunch than are other activities. The correct measure of the worth of mining land is real or projected revenues less all relevant costs. Those costs, moreover, include the return on investment needed to repay outlays to hold minerals and the plant and equipment needed to produce them.

There is simply no way to salvage the MPC's calculations. That the melding of mineral deposits, labor, plant, and equipment produced \$231 billion in output may be interesting but not necessarily in the sense the center claims. Those activities are a trivial part of a giant, 125-year economy.

More critically, the number tells us nothing of public policy relevance. By definition, the profits from mining operations are the difference between revenues and the costs of labor, plant, equipment, and other inputs. A priori, we have no way of knowing how large those windfalls may be. The optimistic possibilities are deposits so attractive in terms of mining cost, ease of ore processing, and proximity to market that very large profits are made. At the other extreme, the prospects may have disadvantages that prevent any windfalls from occurring.

Interestingly enough, none of the pending mining claims discussed by the MPC is an example of the large, high-grade deposits that are the large profit generators in metal mining.(22) They seem more like operations that will generate low or nonexistent rents.(23)

The MPC, in fact, tacitly recognizes that by demanding that taxpayers receive only 8 percent of mining revenues.(24) But if mining land were truly the huge profit generator implied by the MPC, settling for 8 percent of earnings would be the type of policy routinely denounced as a giveaway at fire-sale prices. The only plausible explanation for accepting such a low royalty is that the MPC knows that it is using an inflated measure of worth. All that suggests that the center is manipulating the data to make trivial amounts seem more interesting.

In principle, the true value of the "giveaway" could be anywhere between zero and \$231 billion. The high figure is wildly implausible because mining has never been limited to claims so fabulously profitable that extraction costs are negligible. Zero, in fact, is a much more reasonable figure. Averaged out over the bonanzas and busts, the return on mining claims may be very low. Mining industry folklore has it that the industry is perennially unprofitable. That, too, is obvious hyperbole. Too many firms persisted for long periods for them to have failed to make money.(25) However, the exaggeration is probably much smaller than is the claim of \$231 billion in gain.

If we accept (for the purpose of argument) the 8 percent royalty proposal as an estimate of the rents that properly belong to the taxpayer, the \$231 billion "giveaway" in reality amounts to only \$18.5 billion. Even that adjustment, however, fails to address the problem of those revenues' being returns on investment spread out over extended periods. A correction is needed for the interest charges arising from leaving resources in the ground for extended periods of time.

Unfortunately, the ideal "correction" for the value of unextracted mineral resources at any given moment over the last 125 years cannot possibly be calculated.(26) What we can consider is how asset values are affected by time. We conducted a sensitivity analysis using a wide range of plausible corrections (see Appendix). In our scenarios, the true figure could be as much as 86.6 percent of the \$18.5 billion (\$16 billion) or as little as .014 percent (\$3 million). If we restrict our estimates to "standard" scenarios used in the analysis of investment projects, our estimates range from \$3.9 billion to \$9.8 billion.(27)

Whatever those values, they were earned over a large but unknown number of claims. Mining law specialist John Leshy cites a 1986 government study that reported that 2 million claims "had been recorded," but more recent information suggests that the number of still-valid claims is only 330,000.(28) If, for the sake of argument, 2 million claims were made over the entire history of the 1872 Mining Law, the average "subsidy" received by a claimant under the aegis of that law was worth only \$1.50 to \$8,000 if our broad range (\$3 million to \$16 billion) is used and \$1,950 to \$4,900 if our narrower range (\$3.9 billion to \$9.8 billion) is used. In short, even the simple adjustments we made suggest that the payoff per claim probably has been trivial.(29)

The MPC also applies its gross value methodology to the 30 pending claims that it wished to block at the time of the report. The value of those claims is estimated at \$34 billion.(30) Given the center's apparent belief that an 8 percent royalty is appropriate, the value of those claims falls to \$3 billion. Applying our adjustment methodology (scaling factor of .014 percent to 86.6 percent) then reduces the figure to \$400,000 to \$2.6 billion, or \$13,000 to \$87 million per claim, for the broad range and \$600 million (21 percent  $\times$  \$3 billion) to \$1.5 billion (53 percent  $\times$  \$3 billion), or \$20 million to \$50 million per claim, for the narrower range. Thus, even the potentially successful claims might have trivial values, and even the most generous estimates are too low to justify an elaborate new program.

In sum, intelligent consideration of economics and simple math indicate that critics of the 1872 Mining Law are making political mountains out of "subsidy" molehills. If the 1872 law has created any "giveaways," they range from \$2.5 million to \$16 billion (with the true number probably closer to the lower figure), not \$231 billion. Each recipient of that "giveaway" pocketed at most \$8,000 that was rightfully the taxpayers'. Although subsidies are objectionable, that amount pales in comparison with the exaggerated figures that have been widely cited in news reports and in the halls of Congress.

## Why a Giveaway Really Isn't

The third error critics of the mining fee make is their failure to recognize how subsidies are dissipated through routine market processes. Even if the 1872 Mining Law "gives away" vast wealth to private interests, two fundamental principles imply that those subsidies do not benefit present owners of mining businesses. Both principles reflect a fundamental insight of economics: "good deals" do not persist in markets.

Once information about a "good deal" becomes known, prices change to eliminate excess profits. For example, even if the initial mining-claim process transfers wealth from taxpayers to those who make mining claims, a secondary market for mining claims has existed since 1872. Those who obtained their claims in the secondary market, rather than through the initial "free" claim process, paid market prices for the claims to the original owners and, thus, did not receive a giveaway. If a giveaway occurred, the only possible recipients were the initial claimants under the 1872 law. All others have paid for their claims in the secondary market.

Even in situations in which markets do not exist for the "good deal," like the initial "free" federal mining leases, and no prices exist that can change to eliminate the "good deal," competition will occur through alternative means (such as fees to lawyers who are good at filing claims or dinners for bureaucrats who file the claims) to achieve the same dissipation of excess profits.<sup>(31)</sup> The problem with those implicit forms of competition (referred to by economists as "rent seeking") is that they waste resources.<sup>(32)</sup> The ability to secure valuable assets for no cost leads to investments simply to secure the giveaway. An array of economic studies suggests that vigorous competition for those services (a combination of efforts to comply with the rules for securing the rights and to influence--by legal or illegal means--the grant process) will lead to expenditures equal to the rents.<sup>(33)</sup> Thus, there is no giveaway, but the process is inefficient because resources are diverted from productive uses to unproductive ones.

Although there is not enough information available to determine how much of the 1872 Mining Law's "good deal" was eaten up in rent-seeking costs (if indeed there was any "good deal" available to begin with), we can be reasonably sure that, over the span of 125 years, the market has had more than enough time to react to any subsidy and dissipate it through nonmarket competition.

Conclusion: What Subsidies?

When put under an economic microscope, the giveaways alleged to occur under the 1872 Mining Law prove nonexistent. First, critics err by concentrating on those claims that have returned stunning profits without due consideration of the expected value of the claim. The purchase of assets in markets is best viewed as a lottery.<sup>(34)</sup> Focusing journalistic and political attention on assets that performed well but were bought on the cheap is like focusing critical attention on the winners of a lottery who collect \$10 million but paid only \$1 for the ticket. The ticket price paid by the winner tells us nothing about whether the lottery operator should raise or lower ticket prices in general.

Second, the alleged size of the "giveaway" is dramatically inflated by the law's critics. The widely referenced \$231 billion estimate of that giveaway is wildly unrealistic. First, the \$231 billion figure is an estimate of the cumulative market value of all metals produced on federal lands since 1872. If mining costs are not deducted, it tells us nothing that might help "price" the subsidy. Moreover, since advocates of reform typically demand royalties of less than 10 percent of mining revenues, it is clear that even they do not seriously consider the \$231 billion figure representative of the 1872 Mining Law's subsidy. Back-of-the-envelope calculations suggest that the true subsidy over 125 years ranges from \$3 million to \$16 billion, or \$1.50 to \$8,000 per claimant under the act.

Finally, critics forget that "good deals" are invariably dissipated through market competition as prices change to eliminate excess profits. Moreover, to the extent that any giveaways occurred under the act, the only beneficiaries were the initial claimants under the 1872 law (most of whom are long gone now). All others acquired their claims through secondary markets, where the claims were most certainly sold at market prices.

Beyond the Fee: Speculation, Fraud, and Abuse?

Although the sale of federal mining land for \$2.50 per acre is the main criticism of the 1872 Mining Law, other matters have stuck in the craw of would-be reformers.<sup>(35)</sup> Critics decry private speculation that often occurs when claims are made. They worry that, to the detriment of consumers, resources are being "hoarded" and not exploited quickly enough because only \$100 a year must be spent on developing a site for a claim to remain valid. A related criticism is that land is being claimed under the 1872 Mining Law and diverted to other uses, primarily real estate development. While both observations are accurate, there is nothing necessarily wrong with current practices and little economic reason to control

how mineral lands are used.

Moreover, some critics have maintained that federal ownership of mineral reserves is necessary to ameliorate the negative economic and social ramifications of resource depletion. Shortages are coming, they maintain, and governments would be less likely to recklessly draw down dwindling reserves and would distribute those resources more fairly than would private markets. The 1872 Mining Law, in their view, makes more difficult government's responsibility to manage scarce mineral resources. Not only is that argument incompatible with the criticism that resources are being hoarded; the charge that governments are better able to deal with resource shortages than are market actors is intellectually threadbare.

Speculating about Speculation

Many restrictions are imposed on the timing of mining activities on federal land. Diligence requirements limit how long a lease can be held without any development and how long it can be held after production is shut down. Moreover, regular expenditures are required on land development. Critics, however, often complain that those restrictions are not rigorous enough to constrain speculation and counterproductive hoarding. Others think that restrictions are a good idea but that present ones are more than adequate.

Does the 1872 Mining Law give the federal government too little control over the timing of development? A straightforward implication of efficient markets is that you can never transfer too soon, but you can transfer too late. If mineral rights are transferred before the optimal time to extract, the recipient will wait until the right moment. The only possible danger is that legal barriers will delay a transfer until after the optimum starting date.(36)

Research demonstrates that complications do not alter the case. No market failure unambiguously implies that delaying the creation of transferable property rights to a resource becomes desirable. If monopolies exist in competing for land rights, they will persist over time. If there are problems controlling environmental effects, those problems also arise whenever access is granted. If one posits, as we most certainly do not, that governments are more farsighted than markets, it is still impossible to delineate a workable strategy of delayed release that would be an improvement. Clearly, if one believes, as we do, that governments are less farsighted than market actors, one favors more rapid grants of rights.

This criticism, moreover, applies to postgrant as well as pregrant policy. For the same reasons that grants should be unrestricted, it makes no sense for the federal government to impose any requirements on when and how leased properties are used.

Lawbreaking Reconsidered

Other incendiary critiques of the Mining Law of 1872 are centrally concerned with fraud. The most common example is the patenting of land for a mining purpose followed by a quick sale (usually accompanied by large capital gains) and transformation into a ski resort or real estate development.(37) Those who complain about lawbreaking, however, should realize that the purpose of resource law is to encourage the efficient use of resources. Assertions about land frauds implicitly assume that the statute satisfactorily promotes the efficient use of land resources and, therefore, should be enforced.

Fraudulent uses of patented land are simply the result of unwise restrictions on uses of land that are more profitable than mining.(38) Why should the government "decide" that land should be used for mining rather than for hotels or ski resorts? Seeking to prevent subterfuge without determining its cause is never good policy.(39) Every example presented of the "misuse" of the mining laws (most are real estate examples) involves diversion of the land to uses that would be considered desirable if undertaken in other contexts.

Restrictions on the disposal of public land should be dismantled. Until they are, laws allowing some disposal are preferable to further restrictions on access.

Do Shortages Justify Government Ownership of Resources?

A frequent objection to the transfer of mineral lands to the private sector is that mineral reserves are scarce, dwindling, and imminently depletable. Private owners, critics sometimes argue, will inadequately provide for future generations that might demand those resources. But even in situations in which markets do not preserve future options against all contingencies, the presumption that governments could and would improve on private decisions is doubtful. The global financial community is more imaginative and flexible than any government.

The idea that natural resources are an exception to the above rule comes from the lingering heat generated by the fires of the Progressive Era. Economist Marion Clawson's celebrated survey of public land policy noted that national forests were established because of a "concern for timber supply."<sup>(40)</sup> Gifford Pinchot, founder and first chief of the Forest Service, forthrightly declared, "Conservation is the most democratic movement this country has known for a generation. It holds that the people have not only the right, but the duty to control the use of natural resources."<sup>(41)</sup> The Forest Service likewise maintained in 1933 that "the depletion of America's forest resources may be largely attributed to the national conception of the rights of the private citizen and the policies set up to protect those rights even at the expense of public welfare. Laissez-faire private effort has seriously deteriorated or destroyed the basic resources of timber, forage, and land universally."<sup>(42)</sup>

So what do we make of the concern that private markets overexploit natural resources (and impose corresponding unnecessary environmental damage)? First, we must be clear about the charge. Is it that markets inefficiently exploit resources, or that markets may be efficient but are somehow socially derelict? Most of the political critics of land privatization confuse the two arguments and use them interchangeably. They are, however, two separate matters.

As far as the former argument is concerned, efficient use of land in general--and mining land in particular--may mean development under some circumstances and hoarding under others. For example, many economists have demonstrated that reducing the rate of interest to stimulate investment does not necessarily retard extraction of exhaustible resources.<sup>(43)</sup>

The lower rate of interest makes both holding back (because the lost interest income is lower) and producing (because interest charges on capital are lower) less expensive. When prices greatly exceed costs, the hoarding effect dominates and exploitation slows. When prices are close to costs, however, the cost-lowering effect dominates and exploitation is accelerated.

The finite nature of minerals in the world adds nothing to the argument. Finitude may be irrelevant. Mineral industries seem to behave no differently from unconstrained industries, which usually die because of displacement by a superior product. And some nonmineral industries exhibit patterns supposedly unique to exhaustible resources.<sup>(44)</sup>

The usual concern of those who are skeptical about the market's ability to properly handle the extraction of mineral resources over time is exhaustion. To date, however, no exhaustible resource industry has vanished because of exhaustion of supply.<sup>(45)</sup> Yet many renewable resources have vanished from use because of their limitations. Exhaustible fossil fuels, for example, were adopted as substitutes for supposedly renewable alternatives such as firewood and whale oil. The "limited" supplies of fossil fuel were far larger and more adaptable than those of renewables.

Established producers of nonrenewable minerals have yielded to newcomers long before extinction occurred. In energy, Middle Eastern oil has displaced oil production in the United States and high-cost coal supplies in Western Europe and Japan. Iron ore production in the United States and Europe was similarly replaced by production from Brazil and Australia. Australia did not begin to flourish as an iron ore producer until it removed ore export controls established to shelter domestic steel producers from depletion. The resulting incentives to development increased ore supplies despite their theoretically finite nature.<sup>(46)</sup>

Even if limits are germane, the overwhelming consensus of academic resource economists is that the market will spread the output efficiently over time.<sup>(47)</sup> Happily, however, this entire debate is perhaps moot because of the indisputable fact that mineral resources are becoming more abundant, not more scarce, with time and are probably not depletable at all.<sup>(48)</sup>

In sum, the argument that government must directly manage mineral reserves to either mitigate future shortages or more fairly allocate those reserves in times of scarcity is spurious. Government ownership of mineral reserves--either in the context of the 1872 Mining Law or in the context of the various reforms to that law currently under consideration--is unwarranted.

Prescriptions for Reform: A Second Opinion

Our discussion up until now has concentrated on examining the alleged shortcomings of the 1872 Mining Law. We have



found those criticisms to be largely uninformed and ill considered. Since the diagnosis made by mining law critics is incorrect, it is not particularly surprising that their prescriptions are similarly wrong-headed. In this section we examine the reforms that should not be enacted in a misguided attempt to extract on behalf of taxpayers natural resource rents from the developers of mines.

The reforms introduced in the 105th Congress involve significant changes in how mining companies would gain access to minerals on public lands and how much they would pay for that access.(49) Yet any discussion of charges associated with the transfer and use of publicly owned assets must recognize that landowners have different ways of charging. Three basic legal systems are available:

- charges associated with grant of ownership,
- charges associated with ceding a lease, and
- conventional taxation.

In principle, all possible methods of charging could be employed under any of the legal systems. Charges associated with the grant of ownership or lease are the only efficient method of transferring wealth from buyers to sellers. All three legal systems could be limited to such charges at the time of transfer (and all could impose undesirable obligations for post-transfer charges). However, ownership grants are less likely to impose future levies.

Curiously, none of the proposed reforms of the Mining Law of 1872 advocates the use of one-time charges at the time of transfer of lease or ownership. We, however, advocate that reform in the next section.

Do Not Worry about Past Giveaways

Our most important advice to those who would reform the mining law is not to enact any reforms that affect current claim holders or those who have already privatized their claims under the 1872 law.(50) The reform measures introduced in the 105th Congress by Senator Bumpers and Representatives Rahall and Miller would impose a 5 percent net smelter royalty on existing as well as new mining claims and a progressive profits tax (ranging from 2 to 5 percent) on private mines originally on federal land but patented under the provisions of the 1872 Mining Law.

A maxim in public finance is that an old tax or law is a good tax or law. Once markets recognize the existence of the burden created by a new tax or law, the market prices of land, labor, and capital change to reflect the change. Once that occurs, wealth effects do not occur again as long as the tax or law remain stable. New taxes or laws may and usually do create ongoing efficiency effects, but changes in wealth occur only once.

That central insight of public finance is important because it provides lessons about any policy reform. Just as the initial enactment of policies or taxes causes changes in the distribution of wealth, so do reforms of existing taxes or policies. Those wealth effects are usually the basis for organized support of and opposition to the policy changes. As a result, the efficiency gains from policy reform, for which no one is organized, get lost in the political controversy.(51)

Because the 1872 Mining Law is so old, it is extremely unlikely that any subsidies continue. In the ongoing secondary market in which people trade claims made under the law, all the advantages and disadvantages of those property rights are embedded in the prices that people pay for them, in the same way land prices contain all the advantages and disadvantages created by arbitrary property taxes.(52)

The mischief created by the 1872 Mining Law involves efficiency, not equity. The existence of a below-market price for mining claims (if in fact the current price is below the market price) sets up nonmarket processes by which the benefits are dissipated much as are those associated with finding an apartment in New York City. The resources used in such nonmarket activities are pure waste from society's view.

Unlike the distortions created by the property tax on new investment, however, the "free access" claim system under the 1872 Mining Law has no additional efficiency effects on decisions about the timing or level of extraction from a claim. Moreover, the era of massive claiming is long past. The main wastes have already occurred.

Any changes to the 1872 law should affect only future and not current mining claims. Because the law is so old, all actors in mining markets have operated for some time with expectations based on the property rights regime created by the 1872 law. To rearrange those expectations now for the 300,000 current mining claim owners would cause arbitrary wealth transfers that would activate political opposition and doom any possibility of reform and the efficiency gains that might go with it.

#### Public Ownership with Leasing

One possible reform would alter the policy governing metal mining on public lands to be like the policy that governs offshore oil and gas drilling: public ownership with a leasing system.<sup>(53)</sup> In theory, public ownership with an auction leasing system is economically similar to transfer of ownership to the private sector at auction.<sup>(54)</sup> If the market value of the land remains constant, a series of periodic leases will have the same (risk-adjusted) present value as a one-time sale bid. In reality, however, public ownership is a menace to the purported goal of ensuring that lessees contribute to the Treasury.

First, Congress often undertakes public works to assist those using the public lands.<sup>(55)</sup> Second, government usually cannot resist the imposition of post-transfer charges. Such charges reduce the value of the output from the land and, thus, reduce contributions to the Treasury.<sup>(56)</sup> Third, governments tend to deny leaseholders the flexibility inherent in private property. Land leased under one law can be used only for the use specified in that law rather than the use that would be most profitable. Currently, the federal government offers grazing, mineral extraction, and similar single-use rights on the land it owns.<sup>(57)</sup>

The coal-leasing fiasco of the early 1980s graphically illustrates the difficulties with such a leasing arrangement. Coal leasing underwent a long moratorium beginning in 1971 because of misplaced Interior Department concerns that the need for the coal was unclear. That occurred just as western coal output started substantial growth. Because of various regulatory hurdles, resumption was delayed until the start of the Reagan administration in 1981. A 1982 lease sale was challenged because of concerns over alleged information leaks that were thought to have corrupted the auction. Investigations by the General Accounting Office and the staff of a congressional committee failed to verify the leaks.<sup>(58)</sup> Instead, the methodology for determining minimum acceptable bids was accused of having a severe downward bias.<sup>(59)</sup>

The first step Congress took was to demand an investigation of the administration of existing laws. The commission charged with the study had no choice but to suggest that the Department of the Interior develop procedures that would better assure Congress that the program was run efficiently. DOI was forced to spend two years constructing an overly elaborate bid evaluation process. By then, DOI was not anxious to resume leasing, and no one pressured it to do so.<sup>(60)</sup>

Among the many things that got lost in the congressional inquiry was evidence that the government itself imposed the only barrier to competition in coal reserve bidding. Bidding in large-scale government auctions is generally confined to businesses that are highly likely to attract vigorous competition. The visibility of such auctions means that many of those who aspire to profit from neglected profit opportunities will bid should insiders fail to pay the maximum possible. Such speculators once had participated in coal leasing but allegedly had become discouraged. The most critical disincentive to bid was the "due diligence provision," which limited the time that the coal lease could be held inactive and, thus, made holding the lease less attractive. In the absence of such disincentives, speculators would return (if they ever really left) if established mining companies truly got mining rights at bargain prices.<sup>(61)</sup>

In the end, Congress micromanaged the program to such an extent that it was effectively shut down.<sup>(62)</sup> The coal-leasing experience illustrates the formidable practical barriers to implementing a policy that satisfies all citizens that fair market value was paid. Opponents of leasing auctions are often successful in requiring the search for nonexistent data. Federal valuation guidelines are manipulated to require unattainable certainty.

The political complications involved in public leasing arrangements are reflected in federal guidelines for valuing property acquired or sold. There are three possible accounting methods:

- comparable worth (obtaining market price data on similar properties),
- present value (generating estimates of the profitability of using the property), and

- reproduction cost (inapplicable, of course, to a natural resource).

The guidelines correctly contend that comparable worth is the preferable method since it relies on market data that epitomize informed judgment of values (i.e., the classic case for reliance on market prices is tacitly adopted). Present value is considered inferior because it relies on governmental second-guessing of market valuation.

Neither method, however, can work well for public land unless sales are frequent. Not enough private land is traded to establish comparable worth. Lost in the coal-leasing fiasco, for example, was the fact that the Bureau of Land Management had established comparable worth by establishing rules for adjusting the only sale value report it could obtain. Critics of the BLM generated extensive (and inconsistent) criticisms of the adjustment rules but ignored the more critical point that a single market transaction is no basis for estimation.(63) As long as members of Congress insist on independent government estimates of market value, such indefensible practices will continue.

Thus, not only is the case against accepting market values invalid, but the evidence shows that the government cannot produce satisfactory counterestimates. The sensible conclusion is that independent government estimates of value are an exercise in futility that should be abandoned.(64)

Moreover, if the policy of free exploration access under the mining law is ended, government-funded exploration is a possible but unlikely unattractive alternative. The experience of coal leasing again should give us pause. Coal leasing was once governed by a policy similar to that of the present mining law. Leases were granted noncompetitively to those who first discovered coal. The law that ended noncompetitive leases authorized an exploration program to replace the incentive to be the first claimant. The program, however, was never funded.

Severe problems also arise in devising appropriate incentives for private exploration. That is illustrated by changes made in federal on-shore oil and gas leasing. The right to secure uncontested leases depended on the absence of evidence that oil or gas reserves were "known" to exist beneath the tract of land in question. Unfortunately, the BLM proved incapable of making that determination.

#### The Case against Royalties

If land rents exist, the most efficient way to identify and transfer them is to auction the land and transfer ownership in return for a one-time payment. Private land transactions are conducted in that manner every day. For reasons that are inexplicable to us, legislators and bureaucrats believe that the federal government will be short-changed if land auctions are used to transfer mining lands to the private sector. Instead, they prefer to require payments to the government set as a fixed percentage of sales.(65)

Royalties are economically counterproductive because they vary with the production and sales decisions of the firm. Funds that consumers were willing to give producers are diverted to whoever imposes the tax. That revenue transfer discourages production and consumption and violates the central economic principle that every expansion of output that costs less than its value to consumers should occur.(66)

Royalties are an indirect attempt by the federal government to use a populist distrust of accepting bids for privatization to capture profits. Ironically, the regular tax system probably is at least as effective in capturing profits as are use charges by federal land agencies.(67) A special tax system could be and often is devised specifically to collect profits. The belief that special monitoring agencies are better collection agencies than are regular tax collection organizations is as dubious as often-made proposals that land managers act to complement the actions of specialized environmental agencies in controlling environmental impacts of federal land use.

A further disadvantage of royalties of all types is increased administrative cost. First, any attempt by public officials to evaluate the value of land (for bonus bid evaluation) becomes more difficult. One must calculate a residual (rents minus royalties) of a residual (incomes minus cost). Moreover, requiring more payment means more compliance efforts by government and land users.(68)

The economic theories that support competitive bidding imply that monitoring is unnecessary because competition ensures maximum possible payments. However, policymakers suspect that the conditions needed to produce

competition do not prevail. The imposition of output-related charges is then justified by claiming that the defects of tying the payments to the activity are outweighed by the income gains. Such blind faith ignores all the drawbacks we have noted. Ownership (even with charges) probably produces losses to the federal government and thus its taxpayers.(69)  
Sharing the Wealth: What to Do with Mining Revenues

The populist criticism of "giveaways" created by the Mining Law of 1872 ignores an issue critical to Congress, how recaptured mining income should be distributed among the people. The rhetoric seems to imply that every citizen will share in the revenue generated by royalties and fair-market sales. The rhetoric, however, is misleading, because mining fees are presently distributed primarily to residents of sparsely populated western states. It is not even clear whether those public beneficiaries of present mining payments are a larger or more needy group than the mining company stockholders who are surrendering the wealth.

That phenomenon stems from the fact that Congress allocates half of gross mining receipts to the state in which the activity occurs. Because the federal government assumes responsibility for all the mining program's administrative costs, host states often receive more than the federal government nets before the transfer. Thus, whenever administrative costs exceed the half of gross receipts kept by the federal government, the federal government loses money.(70) That regime could hardly be called desirable.

That practice, unfortunately, is continued in the proposed Title V of the Mining Law Reform Act of 1997 (S. 1102), supported by the National Mining Association. The measure would establish a 5 percent royalty on existing mining claims, new claims, and mining land privatized after the enactment of the reform. The proceeds from the royalty would be deposited in a fund under the control of the state in which the minerals were extracted. The fund would be used for reclamation of abandoned mines.

Another questionable practice is the "earmarking" of the gross federal share of public land revenues for public works in the West. While undesirable, that may not actually result in additional expenditures. The targeting may only be a legal fiction to increase the acceptability of making expenditures that would have been made anyway. If that is not the case, however, such incentives to western projects are as undesirable as every other device to promote spending. Given the evidence of inefficiency and narrow benefits of those projects, evidence that public land revenue stimulates such projects would strengthen the case against wealth transfers. Environmentalists who attack the mining law conveniently forget that rent collection may promote environmentally undesirable actions.

The Path Less Traveled: Robust Privatization

Governments in the United States do not own supermarkets, gas stations, or car manufacturers, and most citizens would object if governments did own such assets. Governments do own land, however, and not only do most people not object, many favor it. They do so because they believe that the federal government owns particularly precious land that cannot be trusted to private ownership.(71) That belief implies that land markets and the extractive activities that take place on land, like mining, do not operate well unless they are publicly owned and subject to scrutiny very different from that received by supermarkets.

Land markets may not be perfect, but neither are most other markets, and we would never accept public ownership as a solution to whatever market failures existed in the manufacture of automobiles. We also should not accept public ownership in land markets.

The Mining Law of 1872 reflects the disposal orientation of the late 19th century, the belief that the government should not own land. We agree with such an orientation and find the 1872 Mining Law one of the better federal resource statutes on the books. It is not, however, ideal.

Its first flaw is that it presumes that, if minerals are found on otherwise nonrestricted federal land, mining is preferable to alternative development options. That single-use concept reflected in the 1872 law--under which federal land can be privatized for mining but not for ranching--is unwise. It undermines the ability of those who value vacant land to compete against other possible users in the market. While alternative uses of land privatized under the mining law are not unheard of (indeed, they are the source of much concern as we noted earlier), those who wish to use "mining" land for other purposes are confronted with unnecessarily burdensome transactions costs that impede their efforts.

The second flaw in the 1872 law is the fixed fee charged those who wish to lay claim to mining land. As noted earlier, the

\$2.50 per acre charge is probably only marginally below the market price (at least, below the market price if the only bidders are mining interests), but still, market prices are preferable to political prices. Yet that flaw is relatively minor. First, it is not altogether obvious that maximizing federal revenues should be the paramount concern of those sympathetic to limited government. Second, the efficiency gains stemming from privatization more than offset any theoretical revenue shortfall caused by suboptimal sale prices. The ideal means of privatizing public assets is probably the process that generates the fewest transactions costs.

Our response to current policies is to call for adoption of competitive bidding for federal land rights with payments only at the time of transfer. Any party with an interest in ownership would be welcome to purchase land at auction and then use it in any way the new owner desired.<sup>(72)</sup> Any failure of that process to recover the full value of the land is better corrected by the general U.S. tax system than by a complicated lease and royalty scheme (which, as we noted above, clearly promotes market inefficiency, political gamesmanship, and political unmanageability).

Ideally, future mining claims should be allocated by auction, but that is secondary to ensuring that existing claims remain unaltered and new claims are free from royalties and unrealistic purchase prices. The new auction system would eliminate the need for potential claimants to engage in wasteful activities that give them an "edge" in the game to get "free" mining claims, but no existing claims would be altered to avoid creating wealth rearrangements that would doom the reform.

In the case of the transfer of public land to private ownership, the auction prices that undeveloped public land would command in a competitive bidding process for the right of private ownership would be an efficient tax like a head tax or pure land tax.<sup>(73)</sup> The maximum anyone would bid in such an auction is the (present discounted) value of the expected rents. Vigorous competition among bidders would force payments to be the maximum.<sup>(74)</sup>

Of course, some environmentalists will object to our proposed reforms because of their misguided preference for public ownership of land or animus against one-time transfer payments for property. But environmentalists should be reminded that under our proposed regime they would gain the right to bid against mining interests for land. There is every reason to believe that, if potential mining properties are environmentally desirable, preservationist organizations could muster the few dollars per acre necessary to win the bidding.<sup>(75)</sup> While our proposed reform would open up all nonrestricted public lands for such bidding (and, thus, accelerate the privatization of public land), preservationist groups would have a greater opportunity to secure rights to that land.

Some mining interests also might look unfavorably on our proposal. They might be concerned that, if others were allowed to bid on property harboring mineral reserves, they would be hard-pressed to make a profit on federal land. And maybe they should worry. Yet our concern, as policy analysts, is that resources be devoted to their highest valued uses. It is not properly our concern how the domestic mining industry might fare under competitive pressures.

A related objection might be that, under our open auction proposal, preservationist groups would have an unfair advantage over mining businesses. That's because wilderness areas, national parks, and other "restricted" lands would not be open for bidding; only lands that are currently available for commercial uses would. Accordingly, preservationist organizations would have more resources at their disposal to outbid rival uses than they would if mining groups could bid against preservationist groups for environmentally sensitive land. However, that argument is a variant of the specious arguments used to criticize the unfair advantages mining companies presently possess. Actually, another virtue of a market economy is its ability to finance attractive investments. The mining industry surely can secure the resources needed to buy the properties whose best use is mining.

Ideally, most public land would be privatized via some sort of auction process (because all land in principle should be put to its most valued use). Yet such an alternative is scarcely on the political horizon. The remote possibility that mining interests might be disadvantaged under our modified auction is a poor reason to abandon the fundamental economic principle that resources should be allocated to those who value them most highly, no matter how distorted the economy might be by the public ownership of resources.

Finally, mining companies (as well as others) often cling to the argument that land ought to be available for "multiple uses" and that our auction proposal would deliver land to owners who might not choose to allow multiple uses of their resources. Any such charge reflects another misunderstanding of market economics. Profit motives will ensure that all profitable uses will be allowed. Advocates of free-market environmentalism often note how environmental groups allow oil and gas drilling on privately held "protected" lands.

Yet the number of uses of land is irrelevant as a public policy criterion. If all the uses are individually consumed goods (private goods), no governmental intervention is justified. Collective consumption issues are not fundamentally altered if given lands have multiple possible uses at least some of which are collective. Sorting out the appropriate multiple collective uses would be virtually impossible absent near omniscience.

Unfortunately, opening up all nonrestricted federal lands to an open, competitive auction might prove too radical an alternative for many legislators and lobbyists regardless of the proposal's merits. The bias against privatization of western lands will likely prove difficult to change in the short term. Accordingly, a second-best alternative might be to allow nonmining interests to bid against mining companies that wish to take title to federal land under the current regime. Privatized land, however, would not have any of the current restrictions regarding subsequent use. The present \$2.50 per acre charge would be the initial offer price.

The theoretic case for market-oriented reforms of the 1872 Mining Act, however, must be conditioned by concern that if a change is made, it might well make the system worse. For instance, it is unclear whether a competitive bidding system would be free of the unrealism that marred federal coal leasing. Thus, we cannot be certain that a shift to competitive bidding BLM style would be a net improvement. We might offset the gains from lesser rent seeking by slowing down land sales.

For that reason, it is probably best to leave the 1872 Mining Law alone and press for public land privatization outside the context of this debate. If a consensus is ever reached that the federal government should divest itself of its vast western land holdings, there will be more than enough time to then repeal the 1872 Mining Law as an inferior and obsolete tool of land disposal. Any reform aimed specifically at the law, no matter how well intentioned or theoretically sound, would probably be corrupted in its execution and prove to be a cure worse than the disease.

Conclusion

Our exploration of the issues surrounding the 1872 Mining Act yields two conclusions. First, the media and many mineral analysts poorly understand the distribution of wealth under the current system. Second, in their moral quest to prevent giveaways and generate revenue for the federal government, reformers have proposed policies that will make the extraction of minerals less efficient and may even increase the burdens on taxpayers.

The distribution of mining profits is poorly understood by those who criticize the 1872 Mining Law because they do not recognize the flaw in the ex post examination of successful assets. Looking backward at the price history of current successful assets ignores all the assets that failed. All those failures are what make investments risky.

Asset prices are most analogous to lotteries. We would not claim that the winner of a lottery paid too little for the winnings because we recognize that most people who buy lottery tickets lose. The same is true for mining claims.

The distribution of mining wealth is also poorly understood by the media because many policy observers do not understand the economics of "giveaways." We do not believe that much wealth has been given away by the Mining Law of 1872, but regardless of the amount, the existence of any amount greater than zero set into motion nonmarket activities that dissipated the benefits of the underpriced giveaway. Those so-called rent-seeking activities completely offset the effect of the giveaway. Giveaways are bad for the economy not because they give anything away (they do not) but because they encourage agents to waste resources to secure the underpriced commodity. Moreover, whatever little is left will be impossible to recapture because it was capitalized into the payments made for mining rights that have been resold.

Whatever the magnitude of the giveaway, it has already occurred. Reforms of the 1872 Mining Law should affect only new claims and have as their goal the prevention of the necessity for rent-seeking activity. The imposition of retroactive charges on existing claims will create political resistance to reforms that eliminate rent-seeking activity and, thus, enhance efficiency.

Overall, the 1872 Mining Law serves America relatively well. It could be improved by broadening its reach to all federal land and allowing any interested party to bid for public resources, but such a reform--if attempted in a more limited manor aimed only at potential mining lands--runs the risk of being corrupted through the political process and overburdened by

special-interest pleadings. Accordingly, the mining law's relatively few flaws should be remedied in the context of overall public land privatization. If that path remains closed because of political considerations, then the 1872 Mining Law probably should be left alone.

#### Appendix: Sensitivity Analysis

Obviously, given the lack of data on mining claims and their use, any attempt to measure the value of those claims must be highly speculative. We can, however, use the simplest standard methods of financial analysis to show how sensitive the results are to various assumptions.

The key point is that the government is ceding the right to secure incomes that start some time after the grant is made and last over the life of the mine. What the government "loses" at the time of sale is the present value of those profits. So, at minimum, we must adjust the income flows to what they were worth at the time of the claim. However, because mines were claimed at different times, the present values of income from different mines cannot simply be added to make them comparable. They should be discounted back to 1872. Unfortunately, we cannot do that because we do not know when various mines were claimed. Instead, we provide estimates for various times of initiation and cessation of mine operations relative to 1872.

A frequent simplification in financial analysis is to consider payments as consisting of a constant annual income over a fixed time period. We therefore tabulated the value of \$1 per year (of mine income) over time periods ranging from 5 to 125 years (thus encompassing a range from a very short mine life to one that lasted through the 125-year history of the 1872 Mining Act). Even the 125-year life assumption in some ways is too conservative. It measures the value in 1872 of mining claims if they were all put in operation immediately or with only the lags considered here. The cost of the law is actually the present value at enactment in 1872 of all the claims ever made and developed. Given that mining did not start immediately or even with a short lag, the values we calculated that assumed a 125-year continuous life are significantly higher than the actual 1872 values of claims.

Because the critics of the 1872 Mining Law use undiscounted incomes in their claims about the size of the giveaway, we calculate the ratio of the present value of the income to the undiscounted gross value of the income over the same time periods. Those ratios, or scaling factors, were calculated for numerous interest-rate (5 to 30 percent) and mine-life (5 to 125 years) scenarios and then further modified to take into account the time needed to develop a mine. That was done for 5-, 10-, and 20-year waits, and the adjustment is substantial. For most mine-life and interest-rate scenarios, a 20-year wait severely reduces the ratios.

As the life of a mine increases, undiscounted receipts increase and, at a given interest rate, present values increase as well. Higher interest rates lower the present value of a given stream of receipts. The combination of cases we considered is so broad that the lowest interest-rate and life combination considered (\$1 per year for 5 years at 5 percent interest) produces a higher present value (\$4.33) than the highest interest-rate and life combination (\$1 per year for 125 years at 30 percent interest, or \$3.33).

In contrast, the scaling factor declines with both interest rate and mine life. At a given mine life, higher interest rates reduce the net present value for any given level of gross receipts. If the life of a mine rises at a given interest rate, the present value does not grow as rapidly as the undiscounted incomes. Thus, in the 5-year, 5 percent case, receipts have a present value of 86.6 percent of their undiscounted value (this is the most optimistic scaling factor used in the text); it falls to 3 percent in the 125-year, 30 percent case.

Finally, increasing the length of the lag between securing a right to mine and the actual start of income from the mine reduces present values and scaling factors. The reductions are independent of the length of mine life. For a 5-year lag, the present values and scaling factors are 78 percent of their values without the lag at 5 percent interest and 27 percent of their values without the lag at 30 percent interest. With a 10-year lag, the ratio changes range from 61 to 7 percent; with 20 years from 37 to .005 percent. (The combined scaling factor is then the product of the factor for immediate start of operations and the factor that accounts for delay.)

Thus, the 5-year, 5 percent scaling factor drops to 67.5 percent with a 5-year wait, to 47 percent with a 10-year wait, and to 33 percent with a 20-years wait. For the 125-year, 30 percent case, the 5-, 10-, and 20-year figures are .7 percent, .2 percent, and .014 percent, respectively. The .014 percent scaling factor produces the \$3 million low end of the range of possible values.

Clearly, discounting income flows to their properly calculated present values severely attenuates the value to the government of a land grant.

Notes

1. Mining Law of 1866, 14 Stat. 251 (1866), and General Mining Law of 1872, 17 Stat. 91 (1872) (codified at 30 U.S.C. §§ 21-54).

2. A vehement critic of the 1872 Mining Law, John Leshy, begins his attack with complaints about how much administrative adjudication is required, "perhaps more than address[es] any other substantive federal statute. . . ." John Leshy, *The Mining Law* (Washington: Resources for the Future, 1987), p. 20. What he fails to see is that the problem stems from the limitation of land grants to particular purposes and claims based on priority. Leshy, a lawyer by training, is currently solicitor for the Department of the Interior. His book does not provide a satisfactory economic analysis of the 1872 Mining Law but does have the virtue of examining only that law rather than all public land issues. It is an invaluable source of facts and (bad) arguments. Two economists, Marion Clawson, once head of the Bureau of Land Management and long on the staff of Resources for the Future, and Robert H. Nelson, long a Department of the Interior economist and now at the University of Maryland, present sounder but more wide-ranging discussions. See Marion Clawson, *The Public Lands Revisited* (Washington: Resources for the Future, 1983); and Robert H. Nelson *Public Lands and Private Rights: The Failure of Scientific Management* (Lanham, Md.: Rowman & Littlefield, 1995). All three books were helpful in writing this paper.

3. Albert Shapiro and Chris Soares, "Cut and Invest to Grow," Progressive Policy Institute Policy Report no. 26, Washington, July 1997, p. 25; and Friends of the Earth, "Green Scissors '97," Washington, 1997.

4. Leshy, p. 295.

5. General Accounting Office, *Federal Land Management: The Mining Law of 1872 Needs Revision* (Washington: Government Printing Office, March 1989), GAO/RCED-89-72, pp. 22-44.

6. Mineral Leasing Act of 1920, 41 Stat. 437 (1920).

7. Amendments to the Surface Resources Act of 1947, 69 Stat. 367 (1955) (codified at 30 U.S.C. §§ 601-15).

8. Leshy, p. 69.

9. The Clinton administration also proposed to achieve environmental reforms through the federal rulemaking process and royalty reforms through the 1998 budget process. See Joby Warrick, "Taking Another Approach to 'Antiquated' Mine Law," *Washington Post*, February 28, 1997, p. A19. The royalty proposals were not even considered by Congress in the budget process, but the environmental rule reform had proceeded through one public input phase by September 1997.

The 1976 Federal Land Policy and Management Act directed the secretary of the interior to "prevent unnecessary or undue degradation of the lands." The regulations implementing that statutory directive were codified at 43 C.F.R. 3809 (1981). On January 6, 1997, Secretary of the Interior Bruce Babbitt proposed that the "3809" regulations be modified to require the use of "best available technology" to prevent environmental degradation. In addition, he requested that claims of less than five acres, currently exempt from a requirement to file a plan of operations with the department in advance of any mining activity, be governed by the same regulations as mining claims larger than five acres. The rulemaking approval process is expected to take 1 1/2 to 2 years. See Bureau of Land Management, Press release, February 25, 1997, at <http://www.blm.gov/nhp/new/press/pr970225.html>.

10. The Hardrock Mining Royalty Act of 1997 (S. 327 and H.R. 778) and the Abandoned Hardrock Mines Reclamation Act of 1977 (S. 326 and H.R. 780). The former would terminate the right to patent (privatize) mining claims for which a patent application was not made prior to September 30, 1994 (sec. 4).



11. See generally Richard Epstein, *Simple Rules for a Complex World* (Cambridge, Mass.: Harvard University Press, 1995).
12. Nelson, pp. 7-10.
13. General Accounting Office, pp. 24, 25. The GAO example at a minimum illustrates the point made below that prospects are often resold and thus government profit recapture is often impossible. Moreover, the mineral involved, oil shale, is one the promise of which consistently fails to be realized. Thus, the profit realized by the claimant was due, not to economic success of the claim, but to a passing interest in oil shale.
14. It is important to emphasize that even examining the full universe of patents would not afford us an honest analysis. Most claims under the 1872 Mining Act were never patented. Presumably, the claims that were patented were those that "panned out," so to speak. Examining only patented claims for an analysis of the appropriateness of the fee again misleads by relying on an unrepresentative subset of all claims.
15. For a fine exposition of this view in the context of financial markets, see Burton G. Malkiel, *A Random Walk Down Wall Street* (New York: W. W. Norton, 1996).
16. For the estimate that land rents are 6 percent of national income, see William A. Fischel, *The Economics of Zoning Laws* (Baltimore: Johns Hopkins University Press, 1985), p. 13.
17. An op-ed in the *New York Times* discussed the transfer of 1,949 acres in Elko, Nevada, to the American Barrick Resources Company for \$9,765 and claimed that the gold that would be mined there was worth \$10 billion. David James Duncan, "How Much Gold Is a River Worth?" *New York Times*, April 12, 1997, p. 23. NBC Nightly News has discussed the 1872 Mining Law twice in its "Fleecing of America" segments. The most recent (April 9, 1997) repeated the claim about the giveaway but quoted a figure of \$270 billion.
18. Thomas J. Hilliard with James S. Lyon and Beverly A. Reece, *Golden Patents, Empty Pockets: A 19th Century Law Gives Miners Billions, the Public Pennies* (Washington: Mineral Policy Center, 1994). Cited hereafter as Mineral Policy Center.
19. One clear example is the assertion repeated several times in the report that a gold deposit in Nevada is worth \$10 billion. The report states that the basis of the calculation is multiplication of reserves by the selling price of refined gold. *Ibid.*, p. 30.
- A modest effort confirms that this is the methodology used throughout. A critical table purports to present estimates of the giveaway but simply presents (by state) figures for the value of the output of several metals. The text indicates the assumed output levels. Thus, the assumed unit values can be computed by simple arithmetic. Comparisons with quotations in the *Wall Street Journal* and the *New York Times* suggest that once again the gross value of output is being presented. The only adjustment made was to take 49 percent of the total as an estimate of the portion of western mining that was on public land. Clearly, the implicit unit values are close to prevailing market prices.
20. Mineral Policy Center, p. 10.
21. *Ibid.*, pp. 12, 30.
22. *Ibid.*, p. 12, lists 30 prospective mines. The estimate of "taxpayer loss" (again, actually the gross value of production) is only \$34 billion. Our methodology discussed below suggests that the mines will generate only \$3 billion in royalties and the present worth of those royalties is at most \$2 billion and might be well below \$100,000.

The mines listed by the MPC include 15 gold mines, 4 gold/silver mines, 1 platinum/palladium mine, 2 copper mines, 2 silver/copper mines, 1 bentonite mine, 1 beryllium mine, and 1 molybdenum mine. The gold mines account for 48 percent

of the "taxpayer loss," the platinum mine almost 10 percent, and the gold/silver mines about 1.5 percent so that almost 60 percent of the value clearly is in precious metals, whose mining typically is done with a narrow profit margin. That excludes the silver share of the 16 percent of value from the copper/silver mines. The biggest value for other mines is almost \$3 billion, or 9 percent, for the molybdenum mine. In no case does it appear that fabulous net profits will arise.

23. A further problem arises from the MPC's consideration of the cumulative value of minerals taken from public lands. Whatever the taxpayers' losses, those from past claims cannot be recovered. At most, history indicates that the problem has existed for a long time.

24. Mining Policy Center, p. 3. Again the report handles this point stealthily. It never directly advocates a royalty at any rate but still creates the impression of support for an 8 percent royalty. The page cited only reports the yield of an 8 percent royalty on a mine the MPC considers a good example; on p. 27, the desirability of a royalty is noted. On p. 33, a bill advocating an 8 percent royalty is summarized; comments elsewhere in the report suggest that this law meets the center's goals.

How it was determined that the 8 percent royalty proposal is optimum is another mystery. Presumably, it arose from crude recognition that higher rates, such as the 12.5 percent on federal coal leases, would kill metal mining. What matters most here is the implication that the MPC knows that the profits generated on land developed under the aegis of the 1872 Mining Law are no more than 8 percent of gross production.

25. According to the January 31, 1997, issue of Value Line, for the years 1992 through 1996 profits as a percentage of revenue for the gold, silver, aluminum, and copper industries were 3 percent, 2.6 percent, 4.3 percent, 7.9 percent, and 5.9 percent, respectively. Of course, people who claim unprofitability would argue that those gains were offset by losses too small to appear in the data. That, too, seems questionable.

26. For such a calculation, we need to know when each claim is made and when its payoff occurs and bring the values back to 1872. However, the data necessary for detailed computation do not exist.

27. Standard assumptions in published studies of investment values assume that projects must earn "around" 10 percent (defined as somewhere between 8 and 12 percent), last for 10 to 20 years, and have delays of 3 to 5 years. Given such assumptions, scaling factors would range from 21 to 53 percent.

28. Leshy, pp. 81-82, 313. Robert Cronin, a natural resources management analyst with the General Accounting Office, says that the number of mining claims has dropped dramatically since the mid-1980s because of the \$100 annual filing fee. In 1988, 1.2 million claims were active. By 1995 the number had dropped to 330,000. Personal conversation, March 6, 1997.

29. The Mineral Policy Center commits three additional crimes against reasonable analysis. First, the bloated value assigned the pending leases is described (p. 11) as more than the sales of all but nine of the Fortune 500 companies. Once again the center relies on exaggeration by aggregation. On one side are the multiple-year incomes of a group of companies. On the other are the single-year sales of Fortune 500 companies. Again, comparative sales are not the right measure of ability to earn profits, and multiyear, multicompany comparisons to one-year figures on one company have no meaning whatever measure is used. Second, jingoism underlies the analysis when the authors note that "nine [mines] are foreign-owned" (ibid.). Third, the only recognition of the undesirable effects of royalty payments (p. 28) is a quotation from the president of a mining corporation that argues about the effects of the royalty on competition with foreign companies. The center, however, uses the quote only as proof that mining companies are scared.

30. Mining Policy Center, pp. 11-12.

31. "The prospect of securing mineral rights and even fee title at bargain prices has proved to be a considerable lure. It has justified hiring imaginative lawyers to obtain under the Mining Law what can no longer be obtained under the homestead or other disposal laws, nor obtained so easily or cheaply under other federal laws." Leshy, p. 91.

32. For an excellent discussion of the phenomenon, see Robert Tollison, "Rent Seeking," in *Perspectives on Public*

Choice: A Handbook, ed. Dennis Mueller (New York: Cambridge University Press, 1997), pp. 506-25.

33. The argument arises, among other places, in the writings on regulation by those associated with the University of Chicago approach to economics, the public-choice approach of James Buchanan and his associates, and in work by various international trade economists. One of the latter, Anne Krueger, produced a widely cited article that gave the term "rent seeking" wide attention. Ann O. Krueger, "The Political Economy of the Rent Seeking Society," *American Economic Review* 64 (June 1974): 291-303.

34. See Nelson, p. 268, for the use of this analogy in the context of mining.

35. The arguments in this section apply to all aspects of public land management, not just the extraction of hardrock minerals.

36. Richard Gordon presented these arguments at a conference on coal leasing in 1979. They were subsequently published in Richard Gordon, *Federal Coal Leasing Policy: Competition in the Energy Industries* (Washington: American Enterprise Institute, 1981), pp. 11-12. For further discussion of the argument that no market failure can be offset by limiting sales or leasing, see Richard L. Gordon, *Regulation and Economic Analysis: A Critique over Two Centuries* (Boston: Kluwer, 1994), pp. 160-65.

37. All three of the most important relevant studies make this point. Economist Marion Clawson, in his widely referenced book specified "fraud and abuse" (pp. 124-28) as the first reason why proposals were made to discourage land disposal. Similarly, Nelson (p. 11) notes that distaste for lawbreaking affected efforts in the first decades of the 19th century to correct problems produced by early federal land policies. Leshy's chapter on "Success, Abuse, and Difficulty: The Up and Down Sides of Free Access in Operation" (pp. 49-87) devotes 6 pages to successes and 22 to abuses, mainly involving the use of claims to get land for nonmining purposes. For a less scholarly example of concern over the matter, see General Accounting Office.

38. The failure of land law to promote efficient disposal is a recurrent theme. Laws designed to facilitate small-scale farming were unsuited for the ranching and forestry uses that were optimal in the West. Nelson (pp. 8-18) adds that many decades were required to secure the laws that encouraged farming. The frauds then are efforts to bypass the impediments.

39. Further restrictions on mining have been imposed in the process of dedicating lands to parks, wildlife refuges, and wilderness and by the so-called Superfund program, which is directed at the cleanup of waste sites so broadly defined that many abandoned mining (and manufacturing) sites are included. The flaws of that program have generated another enormous literature that is ignored here.

40. Clawson, p. 72. See also Nelson, pp. 43-146.

41. Gifford Pinchot, *The Fight for Conservation* (Seattle: University of Washington Press, 1967), p. 81, quoted in Karl Hess Jr., *Visions upon the Land: Man and Nature on the Western Range* (Washington: Island, 1992), p. 79.

42. U.S. Department of Agriculture, Forest Service, *A National Plan for American Forestry*, Senate document no. 12, 73d Cong., 1st sess. (Washington: Government Printing Office, 1933), p. 1589, quoted in Hess, pp. 79-80.

43. Richard Gordon, "Conservation and the Theory of Exhaustible Resources," *Canadian Journal of Economics and Political Science* 32 (August 1966): 319-26.

44. M. A. Adelman, for example, suggests that the production patterns of mainframe computers and long-playing phonograph records followed output patterns (rapid growth followed by slowdown and decline) that were supposedly unique to "exhaustible" resource industries. He says, "For the period 1950-1990, the graph is a fairly good picture of 33 1/3 rpm phonograph record production and for 1950-2000, of mainframe computers." M. A. Adelman, *The Genie Out of the Bottle: World Oil since 1970* (Cambridge, Mass.: MIT Press, 1995), p. 13.

45. In fact, the stock of "exhaustible" resources has been increasing, not decreasing, over time. See *The State of Humanity*, ed. Julian Simon (Cambridge: Blackwell, 1995), pp. 279-93, 303-22, 328-45.
46. See Donald W. Barnett, *Minerals and Energy in Australia* (Stanmore: Cassell Australia, 1979), pp. 191-210, for a review of iron ore developments; the removal of exports controls in 1960 is noted on pp. 182-83. Barnett shows an output rise from 4 million metric tons in 1960 to 51 million in 1970 and 96 million in 1977. Output for fiscal year 1995-96 was reported at 149 million metric tons. Australian Bureau of Resource Economics, *Australian Commodities Forecasts and Issues*, March 1997, p. 113.
47. See Harold Barnett and Chandler Morse, *Scarcity and Growth: The Economics of Natural Resource Availability* (Baltimore: Johns Hopkins University Press, 1963); *Scarcity and Growth Reconsidered*, ed. V. Kerry Smith (Baltimore: Johns Hopkins University Press, 1979); Richard Gordon, "A Reinterpretation of the Pure Theory of Exhaustion," *Journal of Political Economy* 75 (June 1967): 274-86; and M. A. Adelman, "Economics of Exploration for Petroleum and Other Minerals," *Geoexploration* 8 (1970): 131-50.
48. See John Myers, Stephen Moore, and Julian Simon, "Trends in Availability of Non-Fuel Minerals," in *The True State of Humanity*, ed. Julian Simon (Cambridge: Blackwell, 1995), pp. 303-12; and David Osterfeld, *Prosperity versus Planning: How Government Stifles Economic Growth* (New York: Oxford University Press, 1992), pp. 84-103.
49. The Hardrock Mining Royalty Act of 1997 (S. 327 and H.R. 778), sponsored by Senator Bumpers and Representatives Miller and Rahall, would terminate the right to patent (privatize) mining claims made after September 30, 1994 (sec. 4). The industry-sponsored alternative, the Mining Law Reform Act of 1997 (S. 1102), sponsored by Sens. Larry Craig (R-Idaho) and Harry Reid (D-Nev.), would alter the sale of patents of mining land to require a "fair market" value rather than \$2.50 an acre (sec. 204). The "fair market" value, however, would apply only to the land exclusive of any minerals.
50. Robert Nelson and Vernon Smith, "On Divestiture and the Creation of Property Rights in Public Lands," *Cato Journal* 2 (Winter 1982): 663-85, agree with our assessment. Nelson (pp. 333-64) observes that all regulation, including public land policy, creates tacit rights. Leaseholders have undertaken substantial investments in their activities. Reforms, as most advocates of privatizing public land have independently concluded, should recognize those rights. No known system of disposal by competitive bidding can prevent confiscation or total destruction of those investments. The most feasible solution is free transfer of the public land to established users. Only when multiple fresh claimants arise would competitive bidding apply.
51. The Reagan administration's effort to privatize some federal lands was greatly harmed by the introduction of revenue-raising considerations into the argument. Instead of producing support from those wishing to reduce deficits, that simply fostered opposition from current leaseholders. Nevertheless, the Clinton administration has repeated that error by its calls for higher grazing fees and now for emphasis on revenue collection in future grants of rights to extract metal ores from public lands.
52. John Yinger et al., *Property Taxes and House Values* (San Diego: Academic Press, 1988).
53. The oil lease program is not ideal in one important respect, however: it requires royalties in addition to one-time charges at lease inception.
54. The main difference is the identity of who bears the risk of changes in the market value of the asset subsequent to the term of the lease. If the land is leased, the public sector bears the risk of unexpected changes. If the land is sold, the new owner bears the risk.
55. The timber-road access system operated by the Forest Service is a good example. See Jacob M. Schlesinger, "Kasich Prepares Attack on 'Corporate Welfare,'" *Wall Street Journal*, January 17, 1997, p. A14.

56. William Spanger Pierce, *Economics of the Energy Industries*, 2d ed. (Westport, Conn.: Praeger, 1996), pp. 86-90.
57. Under current rules, bidders in federal timber auctions must cut down the trees. See Mark Mauro, "Let Ecologists Buy Federal Timber," *New York Times*, March 29, 1997, p. A23.
58. Late in the hearings by the independent commission appointed to view the situation, the DOI inspector general suddenly remembered that his office had two reports on the issue. One simply disclosed that the Interior Department officials running the leasing program had allowed a lobbyist to treat the officials and their wives to dinner at an expensive Washington, D.C., restaurant. The other report conveyed the tale of a "consulting geologist" who found data on DOI estimates of what the tracts were worth lying in the open in a Mineral Management Service office in Casper Wyoming, memorized the figures, and wrote them down after leaving the office. Those and related incidents are described in *Commission on Fair Market Value Policy for Federal Coal Leasing, Report of the Commission: Fair Market Value Policy for Federal Coal Leasing* (Washington: Government Printing Office, 1984), pp. 381-86.
59. This argument not only ignores our warning that the government cannot assess accurately the value of mineral resources but also relies on both looking at only the "errors" that understate values and stretching the list of questionable objections. The whole controversy boiled down to ill-founded concerns that the collapse in the willingness to pay reflected temporary unfounded pessimism. That seemed a dubious proposition in 1984, and in 1998 it seems absurd.
60. Thus, while the Commission on Fair Market Value Policy for Federal Coal Leasing initially seemed to spur action, only DOI reports were produced, which today lie dusty on bookshelves.
61. One problem in establishing that this competition is possible is that established mining companies are aware of the threat and may preempt it by bids that equal the value of the rights. Obviously, in the charged arena of leasing, an unseen potential is not good enough.
62. The program remained shut down as of the completion of this paper in early 1998.
63. Most members of the coal-leasing commission were clueless about the data deficiency problem. The effort to create awareness backfired. Two noted consultants were invited as witnesses; the executive director and one of the present authors (Gordon) briefed those consultants about the misimpressions about data, but the testimony still created the impression that data could readily be generated.
64. The coal-leasing commission's emphasis on the need to improve valuation arose mainly because its mandate effectively forced acceptance of presale estimates. The problem was exacerbated because only one member of the commission was a natural resource economist or in any other way familiar with public land resource issues.
65. A further complication is that much attention is paid to whether the payment is formally treated as a fee for using the land or a tax. Under a "fee" system, the charge is termed a royalty. Under a "tax" system, the charge is called a severance tax. The distinctions, however, are irrelevant to our argument. The important consideration is that a transfer occurs, not what it is called. Royalties are a broader concept since any land owner can demand a royalty but only governments can tax. For expositional purposes, the terms "royalties" and "severance taxes" are used interchangeably.
66. All outputs with marginal costs (the cost of expanding output) less than price should be undertaken. The main qualification is that if substantial externalities exist, taxes or subsidies are needed to eliminate or "internalize" the externalities. Coase's analysis of externalities shows that private deals can substitute for public ones and that the choice between a tax and a subsidy leaves the decisions unchanged but produces different cost burdens. He further suggests that the best way to share burdens differs from case to case. Ronald Coase, "The Problem of Social Cost," *Journal of Law and Economics* 3 (1960): 1-44.
67. That suggests the additional point that payments to land agencies are an incomplete measure of the overall payoff to government because taxation can be and is used as an alternative to charges.

68. Another advantage of reliance only on payments at the time of transfer is that no need arises to incur expenses of monitoring the level of production on the relevant land.

69. To make matters worse, many severance systems require initial payment in addition to the royalty. The royalties, of course, reduce the initial payment by the present value of the royalties as well as the deadweight losses that arise from sales lost because of the royalties.

70. Nelson (p. 77) reports that the Forest Service estimates that 22 percent of the timber volume harvested in 1978 did not generate enough revenue to cover public costs.

71. As background for this study, we examined the extent of federal land and its use. Although space does not permit presentation of those data, their essence is that a very large part of federal land is used for ordinary commercial activities, mainly ranching and timber harvesting. Those activities can be efficiently conducted on private land, and all the evidence suggests that public ownership inspires less efficient use than occurs under private ownership.

72. For a detailed examination of how such a program might be carried out, see Nelson and Smith.

73. In contrast, taxes on capital and labor (and taxes on land value) are always distortionary because those who are taxed alter their behavior to avoid some of the tax.

74. By vigorous competition we mean a state of affairs such that anyone who earns excess profits attracts to that activity newcomers who compete to reduce the excess. In an auction, vigorous competition would exist if new bidders raised the price paid for land rights.

In public land policy debates, people advocate that sales of public land be conditional on payment of "fair market value." That legal term seems simply to mean what the asset would sell for in a competitive market. The Commission on Fair Market Value for Federal Coal Leases, for example, was told that fair market value had more complex meanings. The only complexity identified was that market values can be hard to determine. The lawyer on the commission was so frustrated by that that he had an associate search the literature and find a Supreme Court decision that said that the adjective "fair" added nothing to the concept.

75. Total contributions (including corporate, foundation, and bequests) to environmental charities in 1994 were \$3.5 billion. U.S. Department of Commerce, Bureau of the Census, Statistical Abstract of the United States 1996 (Washington: Government Printing Office, 1997), tables 610 and 611, pp. 387-88.

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