Improved Policy Making for the Multiple Use of Public Lands

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IMPROVED POLICY MAKING
FOR THE MULTIPLE USE
OF PUBLIC LANDS

Although public lands comprise one-third of the area of the United States, lack of proper legislation has resulted in piecemeal management that hinders effective land use. Current legislation provides for both public and private uses of the public lands.¹ The important private uses include the production of goods and services essential to national economic growth, such as timber, minerals, hydroelectric power, and forage for domestic animals,² while public uses include the protection of such resources as wild game,³ watersheds,⁴ and scenic areas. Other uses, like recreation, may be considered either private or public.⁵

Competition for use of public lands is rapidly increasing, and unrestricted attempts to satisfy any particular need will inevitably hinder attainment of other equally desirable goals. Certain mining operations, for example, currently threaten water quality, scenic values, and wilderness areas.⁶ Clearcutting forests may be the

¹ For purposes of this article, "private" or "economic" uses are those that can be priced by the mechanisms of economic markets, while "public" uses are generally not priced by such markets.

² For example, the government owns about 40 percent of the country's merchantable timber, and federal lands produce approximately one-third of domestic wood production. Most of our known domestic deposits of minerals, other than iron, are located in the public land states of the West, which produce over 90 percent of our copper, 95 percent of our mercury and silver, and 100 percent of our nickel, molybdenum, and potash. Public lands are the key source of water and hydroelectric power in the West, contributing 61 percent of the total natural runoff in the region. Forage for domestic livestock and the expansion of certain urban areas further illustrate private uses of public lands. PUBLIC LAND LAW REVIEW COMMISSION. ONE THIRD OF THE NATION'S LAND 91, 92, 121, 141 (1970) [hereinafter cited as LAND LAW COMM'N]. See also M. CLAWSON, THE FEDERAL LANDS SINCE 1956, at 7–8 (1967).

³ The Fish and Wildlife Service administers over twenty-six million acres. LAND LAW COMM'N 21–22.

⁴ Federal lands provide about 61 percent of the natural runoff in the eleven coterminous western public land states. Id. at 141.

⁵ In 1957, the Forest Service estimated that 135 million recreational visits would be made to the national forests in 1975; this number was nearly attained in 1964. Marion Clawson, former director of the Bureau of Land Management (BLM), estimates that this figure will rise to between 300 and 400 million visits by 1980 and to between 1 and 2 billion visits by the year 2000. Lands administered by the Park Service have experienced a similar unexpected influx of recreationists. While the Park Service anticipated an increase of 25 million visits from 1956 to 1966, the actual increase was closer to 45 million. Given the increased mobility of our population, expanded leisure time, and greater interest in the outdoors, it is not surprising that experts expect the number of visits to the National Parks, "only" 120 million in 1966, to reach 440 million by 1980. See M. CLAWSON, supra note 2, at 9–10, 19–20, 60, 95.

⁶ See notes 39 and 40 and accompanying text infra.
most efficient means of harvesting timber, but it can add silt to streams, destroy hiking trails, and create eyesores. On the other hand, efforts to increase recreational opportunities or enhance environmental quality may require abandonment of other economically profitable uses. The basic problem of land management, then, is allocating limited resources among competing uses; the solution to this problem rests in a more concise definition of public land policy.

The purpose of this article is to analyze the failure of past legislative attempts to define public land policy effectively, to examine current proposals for change, and to present an alternative proposal for a clearer statutory definition of policy.

I. THE FAILURE OF PAST AND PRESENT LEGISLATION TO ASSURE EFFICIENT MANAGEMENT OF PUBLIC LANDS

A. Early Legislation

Prior to 1934, economic efficiency in developing the public lands and the protection of public values were largely unrecognized problems. The prevailing policy, "disposal," favored the ultimate transfer of the public domain into private hands. Some legislation not only failed to promote positive land management, but actually encouraged misallocation of natural resources. Under the General Mining Law of 1872, for example, a miner could obtain full title to his claim for only five dollars per acre; this led to the diversion to mining interests of many acres of national forest land, whose standing timber alone was worth several hundred dollars an acre. The removal of valuable minerals and timber, and widespread misuse of open range land, went largely unchecked.

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8 Marion Clawson describes how this policy prevented the development of a comprehensive system of land management: Management of the public domain hardly existed in any real sense during the decades when the disposal philosophy was dominant; indeed, if one assumed that the land would shortly pass into private ownership and the forests be cleared for farming, there was no reason for management. Clawson, Introduction, in THE PUBLIC LANDS 435 (V. Carstensen ed. 1968).
11 The overall neglect and depredation resulting from this laissez-faire attitude was summarized by Thomas LeDuc, a member of the Advisory Board to the Bureau of Land Management:
[It] is estimated that gold and silver to a value of one billion dollars were removed from government land without payment. Attempts to prevent the
Similarly, only haphazard consideration was given to the protection of public values. The Forest Reserve Act of 1897,\(^{12}\) for example, gave timber production and water supply clear priority over public values.\(^{13}\) Although some conservation acts were passed to create national parks and forests,\(^{14}\) positive legislative action in this area was limited. At the same time, although the executive power under the Forest Reserve Act was used to reserve several areas for national forests,\(^{15}\) Congress later forbade further reservation in seven of the western states without its specific approval.\(^{16}\)

**B. Current Policy—The Multiple Use Acts**

As the need for better land management became increasingly clear, Congress enacted several statutes which specifically recognized interests other than traditional commercial interests as proper objectives of public land management. The earliest attempt to accommodate conflicting user groups through “multiple use” legislation.\(^{17}\) was the Taylor Act of 1934.\(^{18}\) While the primary purpose of the Taylor Act was to regulate grazing practices on the western rangelands,\(^{19}\) it also expressly recognized the right to use the rangelands for recreational hunting and fishing, propagation of wildlife, erosion and flood control programs, water development,


\^ {13} The Act provided that:

No national forest shall be established, except to improve and protect the forest within the boundaries, or for purpose of securing favorable conditions of water flows, and to furnish a continuous supply of timber for the uses and necessities of citizens of the United States. . . .


\^ {14} P. GATES & R. SWENSEN, HISTORY OF PUBLIC LAND LAW DEVELOPMENT 566-67 (1968).

\^ {15} Theodore Roosevelt used the executive power to create twenty-one national forests in 1907 alone. *Id.* at 575.


\^ {17} “Multiple use” in this context refers to land management policies which seek to administer public lands for the accommodation of many different uses. Thus, a single national forest may be administered for both timber production and recreational camping. Even a relatively small tract may support more than one use at the same time.


and general land improvements.\textsuperscript{20} The Act was particularly significant for its recognition that both public and private uses must be protected; that is, on the one hand, public lands must be carefully managed to avoid waste of commercial resources, and on the other hand non-economic values deserve similar protection.

The Multiple Use-Sustained Yield Act of 1960,\textsuperscript{21} which regulates Forest Service lands, contains the first declaration of current multiple use policy: the national forests “are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes.”\textsuperscript{22} Thus, the 1960 Act recognizes the legitimacy of non-economic as well as traditional commercial land uses.

The Act directs the Secretary of Agriculture\textsuperscript{23} to administer the national forests in “the combination [of uses] that will best meet the needs of the American people,” giving “due consideration” to the “relative values of the various resources in particular areas.”\textsuperscript{24} Thus, Congress explicitly recognized that the public lands must be utilized with the greatest possible efficiency in the production of private goods and services. Moreover, not only does the Act declare that the proper uses of national forests include recreation, fish and wildlife protection, and wilderness preservation, but it also recognizes that at times such uses should prevail over economic ones. Consistent with this recognition, the Act directs the Secretary to consider “the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return.”\textsuperscript{25}

The second expression of current multiple use policy is found in the Classification and Multiple Use Act of 1964,\textsuperscript{26} which directs the Secretary of the Interior to apply the same principles of multiple use management to lands administered by the Bureau of

\textsuperscript{20} Id. §§ 11-3, 6-9, 43 U.S.C. §§ 315-315b, 315e-315h (1970).


\textsuperscript{22} Id. § 528.

\textsuperscript{23} The Forest Service is a part of the Department of Agriculture. 16 U.S.C. § 472 (1970). The Public Land Law Review Commission has recommended that the Forest Service be merged with the Department of the Interior to form a new Department of Natural Resources. \textit{LAND LAW COMM’N} 282-83.


\textsuperscript{25} Id. § 531.

\textsuperscript{26} 43 U.S.C. §§ 1411, 1418 (1970). The 1964 Act provided that the Secretary’s power to classify lands for multiple use management was only temporary, and was to expire on June 30, 1969. Pub. L. No. 88-607, § 8, 78 Stat. 988 (1964). This section was amended in 1967 to extend the Secretary’s power until six months after such time as the final report of the Public Land Law Review Commission would be submitted to Congress, an event which occurred on June 23, 1970. Pub. L. 90-213, § 2, 81 Stat. 600 (1967).
Land Management (BLM). The legislative definition of multiple use closely parallels that found in the 1960 Act, making "the most judicious use of the land" a key objective of the policy. Fish and wildlife, outdoor recreation, watershed protection, wilderness, and "public values that would be lost if the land passed from federal ownership" are included with timber, mining, grazing, and industrial uses as proper objectives of land management. The Act requires the Secretary to develop criteria for determining what uses shall be made of each tract, giving "due consideration to all pertinent factors, including, but not limited to, ecology, priorities of use, and the relative values of the various resources in particular areas."

C. Problems of Current Legislation

Because Congress has failed to establish clear standards to guide the agencies charged with administering the multiple use acts, these acts have failed to promote efficient land management. While the acts direct the Secretaries of Agriculture and of the Interior to develop the combination of uses that "will best meet the needs of the American people," they offer no guidelines for the agencies to use in determining what proportion of a particular tract of land should be devoted to a specific use. Congress has required the Secretaries to consider the relative values of the various potential uses, but has provided no express indication of how valuable it considers the different uses to be.

Although the Secretaries of Agriculture and of the Interior have the delegated authority to establish more specific standards, the criteria they have actually promulgated pursuant to the multiple use acts are in most respects no more specific than those provided

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27 Since the BLM and the Forest Service administer approximately 87 percent of the federal lands, the multiple use acts can be considered the most important statements of federal policy concerning the public lands. LAND LAW COMM’N 22.
29 Id. § 1411(a).
30 Id. § 1411(b).
32 Thus, the burden of policy decision-making falls on the agencies. One author has described the effect of this de facto delegation:

Reich observes that professional resource administrators, under the guise of specialization and professionalism, actually decide what the public interest and values are to be in numerous resource situations.... Consequently, the values and the biases of resource administrators are of extreme importance particularly when extensive discretionary power are [sic] given under imprecise congressional legislation.

by Congress. For example, in accordance with the 1964 Act the Director of the BLM issued the following guidelines:

Multiple use means utilization of the various resources in the combination that will best meet the present and future needs of the American people. . . . We will consider both economic demand and intangible social need, and strive for that use or combination of uses which will provide maximum net long term benefit to the general public. . . . [A]ll viewpoints . . . shall be fully considered.\(^{33}\)

More recent regulations have attempted to provide a more explicit delineation of the relative importance of each factor. BLM standards now provide that the goals of land management include “maximum future uses and minimum disturbance . . . of existing users,”\(^{34}\) and “stabilization and development” of the industries dependent on public lands.\(^{35}\) But for the most part the regulations continue to use the same vague generalities contained in the Acts.\(^{36}\)

Congress’ failure to specify more clearly the guidelines for agency action has led to inter-agency conflict and its attendant waste and inefficiency.\(^{37}\) Moreover, even when only a single

\(^{33}\) BLM Manual 1603, app. 1, at 2–3, cited in O’Callaghan, The Mining Law and Multiple Use, 7 Natural Resources J. 242, 245 (1967). In fairness, it should be pointed out that the director, Charles H. Stoddard, did establish at least one priority—that national needs for “resources uses and products” should take precedence over regional and local economic needs.

Carl McFarland has criticized such regulations as being “so general as to add little but fodder for the printer and uninformative reading matter for the public.” C. McFarland, Administrative Procedures and the Public Lands, document prepared for the Public Land Law Review Commission, at 307.

\(^{34}\) 43 C.F.R. § 2410.1(b) (1972).

\(^{35}\) Id. § 2420.2(b).

\(^{36}\) The regulations include such vague requirements as: “The lands must be physically suitable or adaptable to the uses or purposes for which they are classified”; “All present and potential uses and users of the lands will be taken into consideration”; and “The tract of land will then be classified in a manner which will best promote the public interests,” Id. §§ 2410.1, 2410.2. In several cases, the language used follows that of the Act verbatim, thus adding nothing to legislative definitions. See 43 C.F.R. § 2410.1 (1972) and 43 U.S.C. § 1411(b) (1970); 43 C.F.R. § 2400.0–.5(o) (1972) and 43 U.S.C. § 1415(b) (1970).

As deplorable as this situation is, the agencies should not be criticized too harshly for declining to perform a function that ought to have been fulfilled by Congress in the first place. They have been asked to make what is essentially a policy judgment. As McFarland points out:

[T]he agencies should not be criticized for failure to venture explications of policy on subjects upon which Congress is itself sharply divided, e.g., the extent to which the United States should divest itself of title to public lands. In the latter case about all the administrative arm can do, as a practical matter, is await urgencies and then handle them as the exigencies of the moment permit.

McFarland, supra note 33.

\(^{37}\) Different agencies, each acting according to its own interpretation of the law, may operate at cross-purposes. For example, the BLM currently issues mining patents under the 1872 Mining Law for land located in Death Valley National Monument, while the
agency is involved, the effectiveness of such a broad delegation of authority depends largely on the ability of each agency to detect and correct its own inefficient practices. However, since federal land agencies, notably the Forest Service, have been unable to do so, doubt is cast on their ability to promulgate a comprehensive system of goals and standards for land use management.\(^3\)

The failure of multiple use laws to protect environmental values is dramatically illustrated by the mining activities conducted in national parks and wilderness areas.\(^3\) The gross incompatibility of mining with recreational and environmental values which are the primary purposes of these areas is admitted by BLM officials:

Pits or shafts which are dug in alluvium are worse than useless—they impinge on the natural beauty and may contribute to stream pollution—in short, they provide the antithesis of the multiple use management to which the national forests and the public lands are committed by acts of Congress.\(^4\)

Although the spirit of the multiple use acts militates against such a combination of uses, no provision in either Act specifically precludes these practices.\(^4\)

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\(^3\) For example, the Public Land Law Review Commission found that the national forests have large volumes of overmature timber which should have been cut long ago. Failure to do so has resulted in an abnormally high mortality rate for the national forests. According to the Commission, "the annual growth rate in western national forests is somewhat less than one-half of one percent, while managed forests can be expected to grow at several times this rate." LAND LAW COMM'N 97-98.

\(^4\) Certain Forest Service regulations actually encourage wasteful use of timber. The Service charges lumber companies for timber on the basis of the volume actually removed from the forest, while the BLM uses an estimate of the total volume of timber in the area. Once the lumber company under the BLM system has paid, it has an economic incentive to remove all of the timber from the forest for actual use, an incentive not provided by the Forest Service regulations. Thus, the Forest Service has ignored means readily available to increase the yield of timber without unnecessarily increasing the total acreage devoted to timber production. Id.

\(^3\) In Challis National Forest's White Cloud Wilderness in central Idaho, the American Smelting Refining Company began exploration for molybdenum five years ago and is now taking samples from the lower slopes of Castle Peak, the area's dominant landmark, with plans for strip mining. Another mineral developer claims the mineral rights to 30,000 acres of dedicated wilderness encompassing the Boundary Waters Canoe Area in Superior National Forest. Butcher, supra note 37, at 29-30.

\(^4\) O'Callaghan, supra note 33, at 250.
Another difficulty with the multiple use acts is that the executive branch can use the broad discretion vested in it to thwart the express intent of Congress on public land issues. A recent example of such action occurred when President Nixon issued an order to the Secretaries of Agriculture and of the Interior for the cutting of an increased quantity of softwood timber. The order was issued only several months after the House of Representatives had rejected a bill which would have allowed the same action.

II. THE PUBLIC LAND LAW REVIEW COMMISSION

A. The Commission's Recommendations

In 1964 Congress responded to the need for a reevaluation of public land laws by establishing the Public Land Law Review Commission. The Commission was charged with the responsibility to study existing laws and regulations concerning the public lands, review administrative policies and practices, compile data on existing and future demands to be made on the resources of the public lands, and recommend changes in existing laws and regulations. After five years of study the Commission issued a report containing 137 specific recommendations.

The Commission cites the failure of the multiple use acts to provide clear standards to guide the land agencies as one of the most significant shortcomings of current legislation. It characterizes the present situation as one wherein Congress has not defined the primary purpose of use of the lands, but rather has provided the broad "multiple use" authority referred to above with only very general statutory guidelines. However, because of their ambiguity, these acts have failed in some ways to provide adequate guidance.

To solve the problem, the Commission recommends that Con-
gress delineate the specific factors to be considered in all land use planning. The decision-making process should then be standardized among the agencies by providing "common units of measurement" and a system that will ensure "comprehensive analysis" of these units by all agencies.\textsuperscript{47}

The Commission recognizes that a mere list of factors will not solve the typical problem of choosing among conflicting uses. Therefore, it suggests that the choices be made with the aid of a cost-benefit analysis, which would measure the primary and secondary benefits generated by a given allocation of uses against the primary and secondary costs involved in maintaining that allocation, giving "full consideration to non-economic factors in the planning process."\textsuperscript{48} Such an analysis would presumably indicate which combination of uses would yield the "greatest net public benefit."\textsuperscript{49}

The report suggests two alternative approaches whenever the cost-benefit analysis fails to resolve a conflict between uses. The first calls for a firm statement by Congress of preferences among alternative uses after it has determined the national needs for timber, minerals, recreation, and other uses.\textsuperscript{50} Each use would presumably be ranked according to its relative importance, and in the event of a conflict between two or more uses, the use with the highest rank would prevail. A second approach would create a series of preferences for general objectives of public land management.\textsuperscript{51} Thus, conflicts might be resolved by choosing the course of action that would contribute most to regional economic growth, protect extra-market values, or cause the least environmental degradation, depending on which objective had been given the highest ranking.

In place of the ill-defined concept of multiple use, the commission proposes that Congress adopt a "dominant use zoning" system.\textsuperscript{52} This system provides that specific tracts of land within a national forest (or other large area) which have a "clearly identifiable highest use" be zoned solely for that use, permitting

\textsuperscript{47} Id. at 46.

\textsuperscript{48} Id.

\textsuperscript{49} Two analyses of this general sort were conducted for the Commission, using a regional input-output analysis applied to two areas, the Colorado River Basin and the State of Washington. Id. at 47.

\textsuperscript{50} Id.

\textsuperscript{51} Id.

\textsuperscript{52} Id. at 51. On April 6, 1971, Rep. Wayne Aspinall, chairman of the Public Land Law Review Commission, introduced a bill that incorporates the Commission's recommendations on dominant use zoning as part of a congressional restatement of public land policy. H.R. 7211, 92d Cong., 1st Sess. (1971). The bill draws heavily on many other recommendations of and terminology used by the Commission.
secondary uses only "where compatible" with the primary use.\textsuperscript{53} Thus, within any forest there is apt to be a multiplicity of uses.\textsuperscript{54} The Commission claims that statutory approval of this practice would provide clearer "direction" for the agencies in defining the illusory multiple use philosophy, strengthen their ability to deal with secondary users who lobby for a greater allocation of resources, and enable both primary and secondary users to plan their operations with greater certainty.\textsuperscript{55}

\textbf{B. Criticism of the Commission's Recommendations}

Although the Commission correctly identifies the specific aspects of public land laws in need of revision, its proposals for establishing clearer standards to guide the agencies are inadequately developed. The most significant deficiency in the recommendations is their failure to indicate how Congress should establish these standards. The value of the recommendation to apply a cost-benefit analysis to land management decision-making is severely limited since the only congressional contribution would be an initial list of factors to be considered by the local administrators, a list that is already provided by existing multiple use legislation and administrative regulations.\textsuperscript{56} Apparently the onus of deciding the relative value of each listed factor would continue to fall on local agency personnel, who still lack adequate standards for the exercise of the vast discretion vested in them.

The Commission's proposal for the application of cost-benefit techniques to land management should contribute significantly to an efficient allocation of the resources of the public lands among competing needs. But the use of these techniques requires subjective judgments of the relative values of both commercial goods and non-commercial public values.\textsuperscript{57} The failure to describe how

\begin{itemize}
  \item \textsuperscript{53} \textit{Land Law Comm'n} 51.
  \item \textsuperscript{54} The Commission cites as an example the western forests, where the best timber areas are generally located at lower elevations, while higher elevations provide superior recreation opportunities. In such case, some of the upper slopes might be zoned exclusively for recreation, and less elevated areas zoned exclusively for timber production, thus accommodating both uses with the concept of "dominant uses" planning. \textit{Id.} at 93.
  \item \textsuperscript{55} \textit{Id.}
  \item \textsuperscript{56} \textit{See text} accompanying notes 25, 30-31, and 36 \textit{supra}.
  \item \textsuperscript{57} Professor Freeman explains that for each of several approaches to cost-benefit analysis employed in choosing among alternative programs although "the process of valuation can be implicit and can be obscured behind the preferences of a decision maker or apparent objectivity of a predetermined minimum target," the problem of valuation "cannot really be avoided, at least if choices are to be made on anything but an arbitrary or random basis." Freeman, \textit{Project Design and Evaluation with Multiple Objectives}, in \textit{The}
these important judgments are to be made seriously hinders the usefulness of the Commission's proposals for optimal resource allocation.

The proposal for a dominant use zoning system is also inadequately developed, for it is also expressed in vague generalities, the very shortcoming for which the multiple use acts have been criticized. For example, the Commission states that some lands which are “highly productive” of one resource should be used exclusively for that purpose, permitting secondary uses only “where compatible.”58 Just how productive a tract must be in order to be considered “highly productive” and how much interference is permissible before a secondary use is no longer “compatible” is unclear.59 The failure to provide clear standards for defining these terms suggests that they should be defined by local Forest Service and BLM officials, who would not only evaluate the capabilities and resources of the lands under their control, but also decide which of a great number of possible combinations of uses of those resources would best achieve the elusive goal of “the greatest net public benefit.”60

III. A PROPOSAL—USE OF MATHEMATICAL MODELS TO EXPRESS CONGRESSIONAL POLICY

A. Mathematical Models and Public Land Legislation

A different approach to the problem of public land management and policy would involve congressional use of mathematical modeling techniques to express and quantify legislative standards and to define more precisely the respective areas of congressional and administrative responsibility.

Briefly, a mathematical model is a description of a real world
situation in mathematical terms, with each term (axiom) in the abstract model representing some feature of the real world system. By applying mathematical (logical) argument to the model, conclusions may be reached which reveal useful information about the properties of the model and the changes that can be expected if given terms are varied. When these conclusions are translated back into "real world" language, the model yields similar information about the corresponding properties of the real world system. Mathematical modeling therefore is a means of facilitating a precise communication of ideas. It may thus be the best alternative means available to Congress for restating its public land policies without the ambiguities contained in present multiple use legislation.

The Forest Service has already developed certain planning models (referred to as "Resource Allocation Models") to aid in multiple use management. Although these models can be constructed to solve problems involving different uses and costs, the Service has not yet incorporated in the models the basic policy judgments upon which an effective resource allocation must be based.

B. A Proposed Model and Legislative Program

The best combination of uses for a given tract of land depends on two factors: first, the physical characteristics of the land, virtually every schoolboy has used mathematical models in some form or other. Spivey and Thrall cite the formula for determining the speed of a falling object as an example: $g = \frac{d^2y}{dt^2}$. The application of this model of our knowledge of the features of a real world situation, for example, a baseball being dropped from the Washington Monument, allows us to determine the speed of the ball just before it strikes the ground. W. Spivey & R. Thrall, Linear Optimization 18 (1970). For a more comprehensive yet very readable introduction to model theory, see I. Bross, Design for Decision 161-82 (1953).

When used to express policy judgments, the model described not only the real world as it is, but also the world as the policy-maker declares it should be.

One writer has noted:

These models have been successfully used with linear programming techniques to determine least-cost solutions for prescribed multiple use goals. The computerized linear programming solutions have allowed consideration of extremely complex problems involving many different kinds of costs and physical outputs.

Though these Resource Allocation Models presently offer the best solution to multi-product output decisions on Forest Service lands, they do not incorporate the important policy issues involved in setting appropriate production goals. Thus, even the newest refinements for solving multiple use decisions do little to guarantee an optimum solution based on measures of public welfare.

Whaley, Multiple Use Decision Making—Where Do We Go From Here, 10 Natural Resources J. 557, 559-60 (1970).
including its topography, vegetation, mineral resources, fertility, scenic and historic values, and location; and second, the general policy considerations that determine which of many possible uses is the most desirable. These factors can be incorporated in the following equation which states that the most desirable combination of uses \( U_t \) for a given tract is a function of the relative values assigned to each possible use \( V_1, V_2, \ldots, V_n \) and of the physical characteristics of the tract \( C_t \):

\[
U_t = f(V_1, V_2, \ldots, V_n; C_t).
\]

By differentiating those factors requiring subjective value judgments (the "V" or policy variables) from those more capable of objective determination (the "C" variable), the equation sharply distinguishes the issues that should be resolved by expert administrators from those involving general policy questions that are traditionally reserved to Congress.

Of course, at the present time the agencies charged with administering the public lands cannot solve the equation. Although \( C_t \), the variable factor describing the physical characteristics of a tract of land, may be determined in a more or less objective manner,\(^65\) Congress has not clearly set forth the V or policy variables. Congress must therefore quantify the relative values of the various uses, expressing them in common terms, to allow objectively verifiable comparisons of the total utility expected from alternative combinations of uses for a given tract of public land.\(^66\)

A program for the application of modeling techniques to public land policy and management can be instituted in three steps.\(^67\)

\(^65\) One writer has noted, "The criteria of condition and capacity are susceptible of more or less objective determination, and quality is a matter of subjective appraisals...." Tippy, Preservation Values in River Basin Planning, 8 NATURAL RESOURCES J. 259, 271-72 (1968). See also note 64 supra.

\(^66\) Currently, local administrators are the policy makers. "However," as one writer has noted, "complications emerge when resource managers... reach levels where policy is made and as a result can determine what the public interest is in resource decisions.... [T]heir decisions are no longer technological, but rather value decisions." Henning, supra note 32, at 135.

\(^67\) The three steps outlined are similar to those suggested by Whaley, namely, (1) a "realistic, explicit statement of goals," (2) development of a system for valuing diverse kinds of goods and services in comparable, empirically quantifiable terms, and (3) application of the allocation model and value system to multiple use decision-making. Whaley, supra note 65, at 564-65.

An alternative is the proposal by Arthur Maass, who suggests a three step process wherein (1) the agencies collect data on the outcomes of alternative courses of action, (2) the Executive selects one of these courses of action as the most desirable, and (3) Congress accepts, rejects, or modifies the proposal. Maass, Benefit-Cost Analysis: Its Relevance to Public Investment Decisions, 80 Q.J. ECON. 208, 218 (1966).
First, Congress would adopt a general model or series of models, based on the structure of the equation discussed above. After adopting this basic legislation, Congress would assign constant values to those variables specified in the master plan as dealing with issues of policy. The assignment of these constant values would be a non-delegable duty of Congress, and they would be readjusted on a regular basis to allow for changes in societal values and technology. These two steps would yield a precise statement of congressional policy, rather than the vague objectives outlined in current laws. Where different policy goals conflict, relative values assigned to each goal would determine the preferred resolution of the conflict. The final step in the program would require the application of the adopted model to specific land management situations. In this step, each agency would evaluate the characteristics of each tract of land in its jurisdiction, and express this information in terms of the remaining variable factors in the applicable model. The inclusion of this data completes the model, and the best combination of uses of the land can be determined.

The application of this technique can be clarified by an admittedly oversimplified example. Consider a hypothetical tract of land administered by the BLM which is capable of being used either as a wildlife preserve or as a snowmobile course. Through the legislative process Congress would have established a series of weighted values for each land use. These constant values replace the corresponding variables in the land-use model. Assume that the weighted values favor snowmobiling by a ratio of two to one. If the BLM were directed by law to consider only this rough "ranking" system, the snowmobiles would prevail. But under the proposed modeling system, the BLM would have to consider the relative suitability of the land for each competing use. If it determined that the land could sustain only one unit of snowmobiling to each three units of wildlife, then the proper decision, as indicated by the model, would be to utilize the land as a wildlife preserve, since the total value of the land for that use would exceed its value as a snowmobile course.

The selection of appropriate units of measurement is itself a policy decision which may have a surprisingly large impact on actual land management decisions. Cicchetti notes that the use of visitor-days (the unit used by the Forest Service and many other land agencies) as the unit for measuring total recreation provided has the effect of devoting a relatively greater number of recreational facilities to upper income groups at the expense of lower income group. If Congress wishes to avoid this inverse income redistribution it should employ another unit for measuring recreation value. See Cicchetti, Some Economic Issues in Planning Urban Recreation Facilities, 47 LAND ECON. 14 (1971).

The weighted value of the wildlife preserve multiplied by the amount of wildlife that could be sustained on the land \((1 \times 3 = 3)\) is greater than the weighted value of snowmobiling multiplied by the snowmobiling opportunities that could be provided \((2 \times 1 = 2)\).
Most situations would be more complicated than the example described. In many cases, the most desirable outcome would require a combination of several uses, and the model would have to include methods for determining which combination would best serve national policies. A model that will meet this need would be somewhat more complex, but the underlying economic theory for such a model has already been developed, at least for situations involving only two uses. Where these uses must be accommodated on a single tract of land, a three dimensional graph could be used. Where four or more uses are involved, the model would have to use simultaneous equations to arrive at a solution as to the appropriate uses for each part of the land.

C. Anticipated Objections to the Modeling Approach

The proposed mathematical modeling approach is subject to several possible objections. Some might object to quantifying the values of non-economic uses of land, based on the argument that no price tag can be put on such values as scenic or historic uniqueness, or environmental quality. But this objection ignores the fact that such subjective value judgments are constantly being made by current agency action. For example, a decision to build a logging road through a wilderness is based on a judgment that the value derived from the presence of the road exceeds the value of retaining the land in its wilderness state. With no clear policy guidelines to control these value judgments, widely varying decisions might be made by different officials in nearly identical situations. The issue is not whether a price tag should be placed on non-economic values, but whether this shall be done on an ad hoc basis according to the individual views of numerous agency

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71 Id. at 566.
72 See note 32 supra.
73 This was essentially the fact situation involved in Parker v. United States, 309 F. Supp. 593 (D. Colo. 1970), aff'd, 448 F.2d 793 (10th Cir. 1971), where plaintiff successfully prevented the Forest Service from cutting timber in an area allegedly eligible for inclusion in the Wilderness System pursuant to the Wilderness Act, supra note 41.
74 Henning cites an unpublished case study, Behan, The Lincoln Back Country Controversy, (University of Montana, undated), concerning a proposed classification 240,500 acres of national forest near Great Falls, Montana, as legal wilderness, as an example of how Forest Service officials working together arrived at different decisions as to the most desirable use of the land. Henning, supra note 32, at 136.

Professor Sax uses the case of proposed landfill along the Potomac River at Hunting Creek to illustrate how the primary factor motivating officials in the Interior Department is often the desire to mediate among and appear fair to its many constituencies, and how officials with this "insider perspective" may base their decisions largely on the political exigencies of the moment. J. Sax, DEFENDING THE ENVIRONMENT 52 - 56 (1971).
officials, or according to the legislative process by public officials directly responsible to their constituents.\textsuperscript{75}

A more difficult problem concerns the degree of specificity Congress should use in defining individual uses for the purpose of assigning relative values to them. A very simple model might assign values only to general categories, such as "recreation" or "mineral development." Such a simple model would ignore the fact that certain subcategories of recreation, for example, might be more socially desirable than others and ought to be given a greater value than recreation generally. A more complex model could handle this problem by assigning different values to each of a number of narrow subcategories. Thus, Congress might assign values to skiing, fishing, camping, and other specifically defined uses rather than to "recreation." But specificity carried to an extreme would create its own problems, not the least of which would be unnecessary complexity in the model and rigidity in management.\textsuperscript{76} Ideally, Congress should avoid both the vague language of present land legislation and the stifling inflexibility that would accompany too much specificity.

Another objection to the use of mathematical modeling techniques as a legislative tool might be that legislation expressed in this form would be more difficult for the public and many members of Congress to understand than legislation expressed in more traditional forms. Yet members of Congress and various interest groups can easily employ mathematicians, naturalists, and other experts to analyze and interpret the effects of a proposed model or of changes in the values assigned to selected variables. When a particular issue causes unusual controversy and public interest, each of the contending interest groups can be expected to inform the public about its own interpretation of the significance of proposed legislation.

A separate series of problems concerns the ability of the federal land agencies to evaluate the characteristics and potential of each tract in the over 650 million acres administered by the BLM and Forest Service.\textsuperscript{77} Fortunately, not all the land will have to be intensely studied. Past experience may already indicate that certain lands are clearly suitable for only a few uses. Immediate,\textsuperscript{76} Legislators are continually making similar policy decisions. For example, workmen's compensation laws attempt to make an economic evaluation of such non-economic entities as a man's arm, leg, or sight. Similarly, the $10,000 amount-in-controversy requirement of 28 U.S.C. § 1331–1332 (1970) purports to represent the optimum point for balancing a litigant's right to a federal trial with the need for judicial economy.

\textsuperscript{77} A lengthy list of permissible uses, each narrowly defined, might not provide for new varieties of uses (such as cross-country versus alpine skiing) as they develop, or allow for unforeseen methods of utilizing previously known resources.\textsuperscript{77} Land Law Comm'n 22.
detailed studies should be conducted only for lands which are the subject of intense user conflicts, where inefficient allocation of valuable resources is suspected, or where irreversible actions are to be taken.

Even considering such factors, however, the agencies' job will be enormous. A proper evaluation must consider not only the terrain, vegetation, fertility, and other characteristics of the land itself but also its suitability for various uses in relation to its proximity to population and commercial centers, the effects of different management policies on adjacent lands, and perhaps the needs of the local populace. Moreover, the evaluations will have to be updated on a regular basis to allow for changes in all these factors. Fortunately, the BLM has already begun a comprehensive survey of the lands in its jurisdiction under the Classification and Multiple Use Act, and Forest Service experiments with its Resource Allocation Models suggest that the proper land management techniques can be developed to facilitate the role of the land agencies in the proposed program.

IV. CONCLUSION

The importance of the public lands for the support of a vital economy and for the maintenance of non-economic public values demands that they be managed both efficiently and with consideration to all competing uses. The multiple use acts seek to achieve this goal, but fail to provide unambiguous standards for making the subjective policy decisions involved in optimizing public welfare. The federal land agencies have not established adequate policy guidelines on their own; nor should they be expected to do so in areas so deeply concerned with subjective value judgments and national priorities. This lack of standards has led to a situation characterized by uncoordinated, inefficient, and often conflicting land management policies.

Mathematical modeling, already proven successful as applied to the technical aspects of land management, may be a superior means for legislative expression and quantification of policy standards. A properly developed model would force Congress to delineate its policies more precisely and compel the agencies to follow them by making the policy judgments an integral part of the decision model. Mandatory use of the model would assure evaluation of the subjective and objective factors relevant to the achievement of national public land use goals.

—Christopher J. Dunsky

78 See note 66 supra.