NEPA: THEORY AND PRACTICE

THE ROLE OF DATA IN THE EIS PROCESS: EVIDENCE FROM THE BLM WILDERNESS REVIEW

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Various propositions have been offered about the role of the environmental impact statement (EIS) in agency decision making. These include statements that agencies are (1) using the information collected in the EIS to make rational decisions; (2) justifying decisions made a priori; (3) using the EIS to gain support or consensus for projects; or (4) simply fulfilling a legal mandate, with the EIS having no substantive impact on decisions. Previous studies regarding the role of EIS data have focused on the quality of the data in the EIS and whether or not the data are related to decisions. The role of site-specific information in the Bureau of Land Management (BLM) wilderness EIS process is analyzed and the results are used to reflect on the impact of the EIS in agency decision making. These results are compared with an earlier analysis of the Forest Service's Second Roadless Area Review and Evaluation (RARE II).

The results of the statistical analyses of three sets of BLM wilderness EISs indicate that although some of the site-specific information about resource potential is statistically related to agency wilderness recommendations, the vast majority of the information is not. In addition, in some cases, the information was related to wilderness recommendations in a counterintuitive direction. Overall, of the 190 measures of resource potential found in these documents, only 17 (9%) were statistically related to BLM recommendations in an intuitive direction. The fact that most of the information in these EISs is not statistically related to decisions lends support to the proposition that the agency was primarily fulfilling the legally mandated procedure of the National Environmental Policy Act in producing these EISs, rather than achieving the spirit of the law. Results from the analysis of the Forest Service's RARE II wilderness review are similar. Although these analyses may provide support for proposals to improve the EIS through shortening of the documents, more research is needed before it can be assumed that shorter EISs will ensure a link between the remaining information and agency decisions.

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Introduction

According to Channing Kury, the National Environmental Policy Act of 1969 (NEPA, 1969) is "a major piece of federal legislation that continues and will continue to have a premier role in federal decision making" (Kury 1985, p. vii). Observers of NEPA implementation have suggested variously that the impact of NEPA on agency decisions results from external pressure (Liroff 1976) and/or internal reform through both a change in agency personnel (Friesema and Culhane 1985) and more rationally based decision making (Caldwell 1982). After 20 years of implementation, questions remain about the role of NEPA's key mechanism—the environmental impact statement (EIS)—in agency decisions (Bear 1988).

External reform proponents suggest that the EIS places pressure on agencies to make choices that are more environmentally sensitive by providing citizens with access to agency decision making. Internal reform proponents propose that the EIS is a mechanism for the incorporation of more environmental professionals and environmental information into decisions (Culhane, Friesema, and Beecher 1987, chapter 1). These views are not incompatible (Culhane et al. 1987, chapter 1), but they do suggest a tension between the political and technical nature of environmental decisions. On the one hand, NEPA is a statement of environmental policy involving significant political trade-offs and requiring political action for implementation. On the other hand, the Act established a technical mechanism for the implementation of its goals. The literature regarding agency response to the EIS requirement reflects this tension and includes several propositions about what uses agencies make of the EIS process. This paper outlines these propositions, draws together some of the existing evidence supporting them, and provides new evidence gathered from Bureau of Land Management wilderness EISs that sheds additional light on them.

The Purposes of the EIS

What purposes do agencies make of the environmental impact statement? Do agencies use the EIS to make decisions that are more environmentally sound, as NEPA intended? Is the EIS a tool for justifying decisions? Is it a way to gain support or consensus for decisions? Are EISs written simply to fulfill a legally-mandated procedural requirement?

EIS as a Rational Decision Making Tool

The intent of NEPA was to bring about a change in environmental policy, and the EIS became one of the most widely recognized vehicles for that change to occur. The implication of the EIS is that, through the consideration of alternatives and environmental information, agencies will make decisions that are more environmentally sensitive. Caldwell (1982) argued that NEPA was intended to "force federal agencies to consider the possible consequences of decisions having major

implications for the quality of the human environment" (p. 1). He believes the EIS is the major tool through which this change occurs.[1] This leads us to ask how the information in the EIS about environmental impacts is linked to the decisions in the EIS. Does the agency have a rationale that ties these two together? If it does have a rationale, can it be identified, and does it meet the intent of NEPA? The debate about the role of information in the EIS takes at least two forms. Some authors have focused on the quality of information in the process. Others have examined whether or not the information makes a difference in decisions.

Friesema and Culhane (1985) evaluated the quality of social impact assessment in EISs, and Culhane et al. (1987) examined the quality of EIS predictions. Both studies found EISs lacking in both areas when held up to rigorous scientific standards. However, the latter study concluded that EIS predictions "would pass a 'reasonable person' test" and suggested that the Council on Environmental Quality's goal of shorter, better EISs will result in EISs as "an aid in a decision process in which reasonable people were guided by relevant information and common sense" (Culhane et al. 1987, pp. 265, 267).

Beyond the quality of the data in the EIS process, Hill and Ortolano (1978) asked if the NEPA process affected agency consideration of alternatives. The results of their study indicated that NEPA "had not greatly affected either the types of alternatives being considered or who and what influenced the formulation and evaluation of these alternatives" (p. 311). So whether or not good information was available through the EIS process, for the agencies studied (the Army Corps of Engineers and the Soil Conservation Service), the process did not affect the formulation and consideration of alternatives.

Decision Justification

A common charge is that the EIS is a tool for justifying agency decisions. That is, although agencies outline alternative actions in the EIS, it is merely an exercise in procedure. Their real purpose is to justify an already chosen project or action. In so doing, they are pursuing an already chosen agency agenda. According to Ingram (1985), the EIS is "apt to be post hoc evaluation, prepared after decision makers have settled upon a course of action" (p. 101). She indicated that timing is the primary reason for this phenomenon. That is, by the time the EIS is produced, the agency has already focused on a particular action or project. As evidence, she cited a 1972 report by the General Accounting Office indicating that "for the seven agencies they reviewed, impact statements were prepared in stages as proposals moved up the organizational levels toward the final stages of review" (Ingram 1985, p. 101).

[1] Caldwell (1982) suggested that "(the EIS) forced a restructuring of the uses of information . . . in the processes of agency planning and decision making. Without this strategy, there was nothing to compel the agencies to give more than token recognition to the purposes and provisions of NEPA (p. 10).

Similarly, Andrews (1985) found that, until 1973/74 guideline revisions, the Soil Conservation Service (SCS) did not make their EISs public until the final stage of project review. Thus timing of the issuance of EISs made public review a moot point relative to the consideration of alternatives. Further, Hill and Ortolano (1978) noted that before 1974 "the SCS planning procedures required that general project features and cost-sharing arrangements be worked out before an application for 'planning' could be submitted to the SCS Washington Office for planning authorization" (p. 298). To the degree that EISs were conducted after planning authorization in the SCS, then, this constraint prevented the document from becoming much more than a decision justification.

Beyond timing, however, Caldwell (1989) believes that the controversial nature of some projects leads to the "desire on the part of agency staff that EISs should appear to support agency preferences" (p. 26). He lamented the fact that resources are used for the analysis of projects that should be "rejected out of hand" based on NEPA's intent (p. 26).

Friesema and Culhane (1985) suggested that "social impacts ... are marshalled as project justification" (p. 152). Again, they pointed to timing as a source of the problem and concluded that the EIS is "a formal requirement prepared to support a predetermined decision" (p. 160). However, they also offered a more complex interpretation of how agencies use the EIS to gain support for projects.

EIS as a Tool to Gain Support or Consensus for Projects

Although project justification implies that agency personnel write EISs with primarily their own agenda in mind, the interpretation of the EIS as an opportunity to gain support for projects (or at least avoid conflict) suggests that they take account of the agendas of other actors. Friesema and Culhane (1985) proposed the idea that agencies use the EIS "to manipulate client groups, build coalitions and otherwise generate support for programs ... an agency wishes to pursue" (p. 154). Specifically, they suggested that the U.S. Forest Service uses the EIS to generate comments in support of alternatives that would be opposed by their traditional constituent groups. In so doing, the agency considers the agendas of environmental and development interests and plays one against the other in an effort to gain support for a particular alternative (Friesema and Culhane 1985). This suggests an accounting of other agendas, but not necessarily incorporation of the preferences of other actors. The EIS public comment process does provide agencies with a mechanism for gauging and responding to public opinion.

The public comment process associated with EISs allows agencies to gather information about the opinions of interest groups, including both the substance of and the intensity with which those opinions are held. Whether or not these

comments play a role in agency decision making is difficult to measure.[2] One clue might be whether or not an agency makes changes in its proposal from the draft EIS to the final EIS. If no changes occur, it seems that one of three explanations is possible: the public was unaware of the decision and/or EIS's existence; the public was content with the decision; or, if comments indicate disagreement, the agency did not consider the comments significant enough to warrant changes. If changes do occur from the draft to the final EIS, and public input indicates displeasure with agency recommendations, it is possible that public comments played a role. However, more information would be necessary to draw conclusions about the impact of the comments.

Meeting Legally Mandated Procedures

According to Andrews' study of the Army Corps of Engineers and the Soil Conservation Service, "The evidence ... indicates that during the first few years, NEPA's procedures were implemented largely without reference to its substantive purposes" (Andrews 1985, p. 141). His analysis indicated that agency guidelines focused on the implementation of EISs but without consideration of the applicability of NEPA's policy goals, and that the guidelines lacked direction for the evaluation of unquantifiable values. Furthermore, based on survey responses of agency personnel in 1971, Andrews found that the agencies had not substantively changed their proposed water projects as a result of NEPA.

Bear (1988) believes that this focus on meeting procedural requirements has not changed. She suggested that agencies may go through three stages in responding to NEPA: avoidance, compliance with procedures, and use of the process for better decision making. In her view, "many agencies are still in stage two of their evolution in complying with NEPA" (p. 35). Thus many agencies conduct their NEPA-related affairs primarily with an eye toward meeting legally mandated procedural requirements to avoid litigation. She believes this is the result of (1) a lack of support by individuals in key positions, (2) the overloading of NEPA documents with too much "irrelevant or often highly technical detail," (3) the lack of time to meet NEPA obligations, and (4) a "benign neglect" attributable to NEPA's success (p. 35). As a result, the EIS may disclose agency choices and information about environmental consequences without necessarily leading to more environmentally sensitive decisions. Thus agencies fulfill the letter of NEPA without actually adopting the spirit of the law.

[2] Culhane (1990) noted that no definitive study assessing the impact of public participation on project outcomes has been completed. He suggested that "Resources policy scholars believe that the impact [of public participation] has been significant, but we do not know with confidence how significant it has been" (p. 693).

Evidence from RARE II

Mohai (1987a, 1987b) and Mohai and Verbyla (1987) provided more recent evidence bearing on the four explanations of what use agencies make of EISs. Those authors evaluated the U.S. Forest Service's (USFS) Second Roadless Area Review and Evaluation (RARE II) process to determine the extent that site-specific data about 2686 roadless areas influenced agency decisions regarding wilderness/nonwilderness designations. They found that "there was no discernible pattern tying resource potential of roadless areas to designations made" (Mohai and Verbyla 1987, p. 22). Most roadless areas were designated nonwilderness by the agency regardless of the resource potential of the area. In fact, many roadless areas with marginal resource values were designated nonwilderness (Mohai 1987b, p. 543). For example, it was found that in the states of California, Nevada, Oregon, and Washington, the USFS recommended nonwilderness designation for 141 roadless areas in which the costs of resource development were expected to exceed the benefits. Furthermore, the number of nonwilderness areas with marginal resource values (141) exceeded the total number of areas designated wilderness in those four states (116). Also, it was found that the costs of development of marginal nonwilderness areas in the four states were expected to exceed benefits by a factor of 3 to 10 (Mohai 1987b). Another important result was that Mohai's and Mohai and Verbyla's findings contradicted the agency's claim that it followed a 10-step decision process specified in the RARE II Final EIS.

These findings led Mohai (1987b) to conclude that the RARE II EIS process failed to adhere to the classic "rational actor" model of decision making. The lack of relationship between the RARE II data and decisions not only contradicts the proposition that the EIS serves as a rational decision making tool but also contradicts the proposition that the agency used the EIS process to gather data to justify decisions made a priori (as in this latter case, the data and decisions would have likewise been correlated).

Mohai's and Mohai and Verbyla's analyses of RARE II provide modest support for the proposition that the USFS used the RARE II process to gain public support for decisions, as the agency apparently tended to designate as wilderness those roadless areas with the greatest numbers of signatures on letters supporting wilderness designation. However, Mohai (1987b) observed that a relatively small percentage of roadless areas were actually recommended for wilderness (24%), whereas the vast majority were recommended for nonwilderness (58%) or "further planning" (17%), regardless of resource potential. Mohai (1987a) concluded that the agency apparently took public input data into account to identify the most contentious areas for wilderness designation, while at the same time preserving the majority of development options by simply designating most of the areas nonwilderness. This effort to gain public support for agency recommendations proved to be a meager one, however, because environmental-

ists, in fact, were not appeased. Shortly after the issuance of the Final EIS, environmentalists launched a successful legal challenge to the RARE II Final EIS and won. Therefore, at best, these outcomes provide modest support for the proposition that the agency used the EIS process to gain support for its decisions. The proposition remaining is that, rather than providing a substantive purpose, the USFS RARE II EIS functioned primarily to simply fulfill NEPA's legal requirement.

The Bureau of Land Management Wilderness Review

The Bureau of Land Management (BLM) Wilderness Review offers an opportunity to gain further insight into the role of the EIS in agency decision making. In pursuing the mandate of the Federal Land Policy and Management Act (FLPMA) to inventory its land for wilderness potential and make recommendations to Congress for the designation of wilderness areas, the BLM established a process that included the writing of wilderness environmental impact statements as the second of three stages.[3] These documents analyze wilderness study areas and contain a great deal of site-specific information about resource potential and the impact of various alternatives (from no wilderness to all wilderness) on those resources. Furthermore, the EISs present the agency's recommendations for wilderness designations. The implication made in the EISs is that the BLM made wilderness recommendations based on this information. However, unlike the USFS RARE II EIS, most of the BLM wilderness EISs do not explicitly identify a rationale for agency recommendations.[4] If the BLM did use the resource information to make "better" environmental decisions or to justify decisions, then information about resources should be statistically related to decisions. For example, given that wilderness designation precludes the establishment of new mining activity, one might expect that high mineral and energy potential in wilderness study areas would be associated with recommendations against wilderness designation. Furthermore, although wilderness designation does not preclude range activity, it has the potential to make such activity more cumbersome through the prohibition of motorized vehicles.[5] Thus high range potential may be linked to recommendations against wilderness designation. Finally, to the degree that the BLM recorded wilderness potential, this

[3] The three stages are inventory, study, and reporting. In the first stage, the agency reviewed all of its land for statutorily defined wilderness attributes as identified in the Wilderness Act of 1964 (16 U.S.C. & 1131(c)): naturalness, outstanding opportunities for primitive recreation, outstanding opportunities for solitude, and size. Land that passed on to the next stage, study, was evaluated through the EIS process in parcels known as wilderness study areas. In the third stage, reporting, the agency produces Wilderness Study Reports that document agency recommendations to Congress.

[4] The Utah wilderness EIS is an exception to this. In The Utah Final Wilderness EIS, the agency indicates what its rationale for wilderness recommendations for each wilderness study are. In effect, these are post hoc rationales and are fundamentally different from the decision process established by the USFS in the RARE II EIS.

[5] The agency can provide exceptions to the motorized vehicle prohibition, however, even where this is the case, the livestock operator must fulfill procedural requirements that would not exist except for the fact that he or she is conducting his or her operation within a wilderness area. Thus, at the very least, wilderness designation makes the bureaucratic process more cumbersome even if on-the-ground operations are not affected.

information should have a strong positive relationship with agency recommendations for wilderness.

If the evidence indicates that the data are related to agency recommendations, then there is support for either of the propositions that the EIS is used for "better" environmental decision making or for decision justification. If there is evidence that public comments played a role in agency recommendations, the possibility exists that the agency sought to incorporate the agendas of other actors to achieve some consensus about wilderness recommendations through the EIS process. On the other hand, if resource information is not related to decisions and public comments do not appear to play a role, then the possibility exists that the agency completed the wilderness EISs simply to fulfill a legal requirement.

Data and Methods

If site-specific information about resource potential influenced BLM wilderness recommendations in the wilderness EISs, then a significant correlation should exist between the site-specific data and the recommendations. We used multiple linear regression analysis to test for these relationships, with the agency recommendation as the dependent variable and various measures of resource potential as the independent variables. We obtained this information from the final wilderness EISs for New Mexico, Oregon, and Utah BLM.[6]

We recorded potential for the resources present in each wilderness study area as indicated by the agency in the statewide volumes of the wilderness EISs. These included assessments of the presence of various mineral, energy, range, recreation, and wilderness resources, a reflection of the categories included in the BLM's multiple-use mandate as established in the Federal Land Policy and Management Act of 1976 (FLPMA 1976; see Tables 1 to 3 for an enumeration of categories and resources by state; more detailed explanations of each state's resource assessment will be given later). Where the wilderness EIS provided information about land status (i.e., acres of inholdings—land owned by entities other than the federal government) in or around wilderness study areas and estimates of economic factors, we included them in the analysis as well. Finally, we computed the percentage of each wilderness study area recommended for wilderness designation.

Using the resource potentials as independent variables and the agency recommendation as the dependent variable, we conducted the regression analyses in two stages. First, we grouped the resource potentials by multiple-use categories

[6] We analyzed these three states, rather than any of the other states in which BLM conducted the wilderness review process, because they conducted statewide EIS processes. The other BLM states conducted wilderness EISs primarily on a district basis. Analyzing district decisions was impossible because of the small number of cases in each district. Analyzing across districts would have introduced a level of inconsistency that would have been difficult to overcome. We analyzed New Mexico, Oregon, and Utah separately, rather than all together, for three reasons. First, the BLM is a decentralized agency, and assuming consistency in the evaluation of resource potential across state offices is problematic. Second, the problem of decentralization is further complicated by the lack of official guidance from the Washington Office specific to the wilderness EIS process. Third, although information used to evaluate resource potential is similar between states, it is not identical.

TABLE 1 List of Variables for New Mexico by Multiple-Use Category

Dependent Variable	
Percentage Wilderness	Percentage of the WSA recommended for wilderness
Wilderness Resources—Recreation/Solitude Opportunities	
Albuquerque	Distance between WSA and Albuquerque, NM, in driving hours
Las Cruces	Distance between WSA and Las Cruces, NM, in driving hours
Santa Fe	Distance between WSA and Santa Fe, NM, in driving hours
Tucson	Distance between WSA and Tucson, AZ, in driving hours
El Paso	Distance between WSA and El Paso, TX, in driving hours
Lubbock	Distance between WSA and Lubbock, TX, in driving hours
Energy Resources	
Coal Acres	Total acres in WSA with high/moderate coal potential
Geothermal Acres	Total acres in WSA with high/moderate geothermal potential
Oil/gas Acres	Total acres in WSA with high/moderate oil/gas potential
Uranium Acres	Total acres in WSA with high/moderate uranium potential
Percent Energy Acres	Percentage of WSA with high/moderate energy potential
	Scale for potential: 3 = high; 2 = moderate; 1 = low
Coal Potential	Potential for coal in WSA
Geothermal Potential	Potential for geothermal in WSA
Oil/gas Potential	Potential for oil/gas in WSA
Uranium Potential	Potential for uranium in WSA
Average Energy	Average potential for all energy resources in WSA
Mineral Resources	
Cobalt Acres	Total acres in WSA with high/moderate cobalt potential
Copper Acres*	Total acres in WSA with high/moderate copper potential
Gold Acres*	Total acres in WSA with high/moderate gold potential
Lead Acres*	Total acres in WSA with high/moderate lead potential
Molybdenum Acres*	Total acres in WSA with high/moderate molybdenum potential
Nickel Acres	Total acres in WSA with high/moderate nickel potential
Silver Acres*	Total acres in WSA with high/moderate silver potential
Tin Acres	Total acres in WSA with high/moderate tin potential
Tungsten Acres*	Total acres in WSA with high/moderate tungsten potential
Zinc Acres*	Total acres in WSA with high/moderate zinc potential
Barite Acres*	Total acres in WSA with high/moderate barite potential
Stone Acres*	Total acres in WSA with high/moderate building stone potential
Cinder Acres	Total acres in WSA with high/moderate cinders/scoria potential
Flourspar Acres*	Total acres in WSA with high/moderate flourspar potential
Gypsum Acres	Total acres in WSA with high/moderate gypsum potential
Lime Acres	Total acres in WSA with high/moderate high calcium limestone potential
Humate Acres*	Total acres in WSA with high/moderate humate potential
Percentage Mineral Acres*	Percentage of WSA with high/moderate mineral potential
	Scale for potential: 3 = high; 2 = moderate; 3 = low
Bismuth Potential	Potential for bismuth in WSA
Cobalt Potential	Potential for cobalt in WSA
Copper Potential	Potential for copper in WSA

TABLE 1 List of Variables for New Mexico by Multiple-Use Category *(Continued)*

Gold Potential	Potential for gold in WSA
Iron Potential	Potential for iron in WSA
Lead Potential	Potential for lead in WSA
Manganese Potential*	Potential for manganese in WSA
Molybdenum Potential	Potential for molybdenum in WSA
Nickel Potential	Potential for nickel in WSA
Silver Potential	Potential for silver in WSA
Tin Potential	Potential for tin in WSA
Tungsten Potential*	Potential for tungsten in WSA
Zinc Potential	Potential for zinc in WSA
Cinder/Scoria Potential	Potential for cinders/scoria in WSA
Rock Potential*	Potential for crushed rock in WSA
Sand/Gravel Potential*	Potential for sand and gravel in WSA
Barite Potential	Potential for barite in WSA
Stone Potential	Potential for building stone in WSA
Flourspar Potential	Potential for flourspar in WSA
Gypsum Potential*	Potential for gypsum in WSA
Lime Potential	Potential for high calcium limestone in WSA
Dolomite Potential*	Potential for high magnesium dolomite in WSA
Kaolin Potential*	Potential for kaolin in WSA
Salt Potential	Potential for salt in WSA
Zeolite Potential	Potential for zeolite in WSA
Claims*	Number of mining claims in WSA
Average Mineral*	Average mineral potential for WSA
Range Resources	
AUMs	Total animal unit months in WSA
Number Allotments	Number of grazing allotments in WSA
Total AUM/allotment	Total animal unit months in allotments
Head Number	Number of head of livestock supported per section
Range Developments	
Ways	Number of miles of vehicle "ways" in WSA
Reservoirs	Number of reservoirs in WSA
Fence	Miles of fence in WSA
Pipe	Miles of pipeline in WSA
Troughs	Number of troughs in WSA
Tanks	Number of water tanks in WSA
Windmills	Number of windmills in WSA
Corrals	Number of corrals in WSA
Springs	Number of springs in WSA
Wells	Number of wells in WSA
Land Status	
Private Land	Acres of private inholdings
State Land	Acres of state inholdings
Percentage Private	Percentage of WSA in private inholdings
Percentage State	Percentage of WSA in state inholdings

WSA = wilderness study area.
**Mineral variables where Pearson r with percentage wilderness >0.10.*

TABLE 2 List of Variables for Oregon by Multiple-Use Category

Dependent Variable	
Percentage Wilderness	Percentage of the WSA recommended for wilderness
Recreation Resources	
	Scale: 1 = present; 0 = not present
Hunting	Hunting activity in WSA
Fishing	Fishing activity in the WSA
Rafting	Rafting activity in WSA
Off-road-vehicles	Off-road-vehicle activity in WSA
Rockhounding	Rockhounding activity in WSA
Hiking	Hiking activity in WSA
Horse	Horseback riding activity in WSA
Cave	Cave exploration activity in WSA
Other	Other activities in WSA including sightseeing, photography, camping
Special Features	
	Scale: 1 = present; 0 = not present
Geology	Special geologic features in WSA
Plants	Special plant species in WSA, including threatened and endangered species
Animals	Special animal species in WSA, including threatened and endangered species
Energy Resources	
	Scale for potential: 3 = high; 2 = moderate; 1 = low
Coal Favorability*+	Potential for occurrence of coal in WSA
Geothermal Favorability	Potential for occurrence of geothermal in WSA
Oil/Gas Favorability*	Potential for occurrence of oil and gas in WSA
Tar Sand Favorability	Potential for occurrence of tar sand and oil shale in WSA
Uranium Favorability	Potential for occurrence of uranium in WSA
Average Energy*	Average potential for energy resources in WSA
	Scale for quality of evidence: 3 = high; 2 = moderate; 1 = low
Coal Certainty*++	Quality of evidence for coal assessment
Geothermal Certainty*	Quality of evidence for geothermal assessment
Oil/Gas Certainty	Quality of evidence for oil and gas assessment
Tar Sand Certainty*	Quality of evidence for tar sand and oil shale assessment
Uranium Certainty*	Quality of evidence for uranium assessment
Mineral Resources	
	Scale for potential: 3 = high; 2 = moderate; 1 = low
Bentonite Favorability*	Potential for occurrence of bentonite in WSA
Copper Favorability	Potential for occurrence of copper in WSA
Diatomite Favorability*	Potential for occurrence of diatomite in WSA
Gold Favorability*	Potential for occurrence of gold in WSA
Limestone Favorability*	Potential for occurrence of limestone in WSA
Mercury Favorability*	Potential for occurrence of mercury in WSA
Potassium Favorability	Potential for occurrence of potassium in WSA
Sodium Favorability*	Potential for occurrence of sodium in WSA
Silver Favorability*	Potential for occurrence of silver in WSA
Zeolite Favorability	Potential for occurrence of zeolite in WSA
Average Mineral	Average potential for mineral resources in WSA

TABLE 2 List of Variables for Oregon by Multiple-Use Category *(Continued)*

	Scale for quality of evidence: 3 = high; 2 = moderate; 1 = low
Bentonite Certainty	Quality of evidence for bentonite assessment
Copper Certainty	Quality of evidence for copper assessment
Diatomite Certainty*	Quality of evidence for diatomite assessment
Gold Certainty*	Quality of evidence for gold assessment
Limestone Certainty*	Quality of evidence for limestone assessment
Mercury Certainty	Quality of evidence for mercury assessment
Potassium Certainty	Quality of evidence for potassium assessment
Sodium Certainty	Quality of evidence for sodium assessment
Silver Certainty*	Quality of evidence for silver assessment
Zeolite Certainty	Quality of evidence for zeolite assessment
Range Resources	
Total AUMs	Total animal unit months licensed for WSA
Total Potential AUMs	Total potential in increase in licensed animal unit months
Positive Increase	Potential increased animal unit months with positive benefits
Potential Vegetation	Potential increased animal unit months with vegetation manipulation
Potential Structure	Potential increased animal unit months with structural projects
Proposed Improvements	Number of range improvements classified in WSA
Foregone AUMs	Maximum animal unit month forage foregone
Land Status	
Private Land	Acres in WSA in private ownership
State Land	Acres in WSA in state ownership
Split Estate	Acres in WSA in split estate ownership
Percent Nonfederal	Percent of WSA in non-federal ownership
Dollar Resources	
Personal Income Upper	Upper limit of personal income derived annually from WSA resources
Personal Income Lower	Lower limit of personal income derived annually from WSA resources

WSA = wilderness study area.
**Mineral variables where Pearson r with percentage wilderness >0.10.*
†Oregon BLM uses the term mineral "favorability" for mineral potential. The same labeling convention is used here.
††Oregon BLM records the quality of the evidence used to evaluate mineral potential on a "certainty" index. The same labeling convention is used here.

and conducted a regression analysis for each group. This allowed us to obtain a sense of how strong the relationships might be between types of land use in the wilderness study area and the agency recommendations. We then noted which resource potentials in each multiple-use category were statistically significant and entered these, together, into a second regression analysis. Thus we conducted an "aggregate" regression that included the statistically significant resource potentials from each of the multiple-use categories. This allowed us to determine whether particular multiple-use categories, as represented by the statistically significant individual resource potentials, seemed to dominate in their relationship with agency recommendations. This aggregate regression also provided an opportunity to check our results for consistency.

TABLE 3 List of Variables for Utah by Multiple-Use Category

Dependent Variable	
Percentage Wilderness	Percentage of the WSA recommended for Wilderness
Wilderness Resources	
Percentage Natural	Percentage of WSA with naturalness
Percentage Solitude	Percentage of WSA offering outstanding opportunities for solitude
Percentage Recreation	Percentage of WSA offering outstanding opportunities for primitive recreation
Scenic	Presence of scenic features in WSA (1 = present; 0 = not present)
Historic	Presence of historic features in WSA (1 = present; 0 = not present)
Ecology	Presence of ecological features in WSA (1 = present; 0 = not present)
Geology	Presence of geological features in WSA (1 = present; 0 = not present)
Other	Presence of wild horses/perennial water in WSA (1 = present; 0 = not present)
Scenic Designation	
Acres Scenic A	Acres in WSA classified Scenic A
Acres Scenic B	Acres in WSA classified Scenic B
Acres Scenic C	Acres in WSA classified Scenic C
Percentage Scenic A	Percentage of WSA classified Scenic A
Percentage Scenic B	Percentage of WSA classified Scenic B
Percentage Scenic C	Percentage of WSA classified Scenic C
Energy Resources	
	Scale for potential: 3 = high; 2 = moderate; 1 = low
Oil/Gas Favorability+	Potential for occurrence of oil and gas in WSA
Tar Sand Favorability*	Potential for occurrence of tar sand in WSA
Oil Shale Favorability*	Potential for occurrence of oil shale in WSA
Coal Favorability*	Potential for occurrence of coal in WSA
Uranium Favorability*	Potential for occurrence of uranium in WSA
Geothermal Favorability*	Potential for occurrence of geothermal in WSA
Hydro Favorability*	Potential for occurrence of hydropower in WSA
Average Mineral Fav*	Average mineral favorability in WSA
	Scale for quality of evidence: 3 = high; 2 = moderate; 1 = low
Oil/Gas Certainty*+	Quality of evidence for oil and gas assessment
Tar Sand Certainty*	Quality of evidence for tar sand assessment
Oil Shale Certainty*	Quality of evidence for oil shale assessment
Coal Certainty	Quality of evidence for coal assessment
Uranium Certainty*	Quality of evidence for uranium assessment
Geothermal Certainty*	Quality of evidence for geothermal assessment
Hydro Certainty*	Quality of evidence for hydropower assessment
Mineral Resources	
	Scale for potential: 3 = high; 2 = moderate; 1 = low
Potash Favorability*	Potential for occurrence of potash in WSA
Copper Favorability*	Potential for occurrence of copper in WSA
Manganese Favorability*	Potential for occurrence of manganese in WSA
Gold Favorability*	Potential for occurrence of gold in WSA
Silver Favorability	Potential for occurrence of silver in WSA

TABLE 3 List of Variables for Utah by Multiple-Use Category *(Continued)*

Other Favorability*	Potential for occurrence of other locatable and salable minerals in WSA
Average Mineral Fav*	Average potential for minerals in WSA
	Scale for quality of evidence: 3 = high; 2 = moderate; 1 = low
Potash Certainty*	Quality of evidence for potash assessment
Copper Certainty	Quality of evidence for copper assessment
Manganese Certainty*	Quality of evidence for manganese assessment
Gold Certainty	Quality of evidence for gold assessment
Silver Certainty	Quality of evidence for silver assessment
Other Certainty*	Quality of evidence for other minerals assessment
Range Resources	
Percentage Allotment	Percentage of grazing allotment in WSA
Number Operators	Number of operators in allotment in WSA
AUM Allotment	Number of animal unit months in allotment
WSA AUMs	Number of animal unit months in WSA
Percentage AUM	Percentage of allotment animal unit months in WSA
Number Allotments	Number of allotments in WSA
Range Developments	
Existing Developments	Number of existing range developments in WSA
Proposed Developments	Number of proposed range developments in WSA
Land Status	
Percentage Private	Percentage of WSA in private ownership
Percentage State	Percentage of WSA in state ownership
Adjacent Wilderness	WSA adjacent to national park or wilderness area (1 = yes; 0 = no)
Right of Way	Presence of Right-of-ways in WSA (1 = present; 2 = not present)

WSA = Wilderness study area
**Mineral variables where Pearson r with percentage wilderness is greater than >0.10*
+Utah BLM uses the term mineral "favorability" for mineral potential. The same labeling convention is used here.
++Utah BLM records the quality of the evidence used to evaluate mineral potential based on a "certainty" index. The same labeling convention is used here.

Although each state's wilderness EIS included information about resource potential that falls into the multiple-use categories of minerals, energy, range, recreation, and wilderness, the way in which this information was recorded was unique to each. The following paragraphs discuss some of the similarities and differences in how each state recorded resource potential.

New Mexico

In New Mexico, the agency provided quantified information regarding the various mineral, energy, and range resources within each wilderness study area. In addition, information about wilderness characteristics and land status was included in the statewide EIS (USDI Bureau of Land Management 1988).

Mineral and energy potential was assessed in two ways. The agency recorded the number of acres in a wilderness study area with high and moderate potential for some of these resources (e.g, the number of acres with high coal potential). In addition, it provided an overall assessment for mineral and energy potential in each wilderness study area (e.g., wilderness study area *X* has high, moderate, or low potential for coal). The New Mexico statewide EIS also included information about range resources in two forms: the potential for each wilderness study area to support livestock (e.g., number of animal unit months [AUM] present in a wilderness study area; numbers of head of livestock) and the number and types of existing and proposed range developments present in each wilderness study area (e.g., the number of reservoirs).

The agency recorded relative distances to major urban centers as a measure of the potential of the wilderness study areas to provide opportunities for primitive recreation and solitude to urban populations (e.g., hours of driving time from the wilderness study area to Albuquerque). The assumption is that the closer a wilderness study area is to an urban center, the more opportunities it provides to service demands for wilderness recreation experiences.

Finally, the New Mexico wilderness EIS included information about "land status" in the wilderness study areas. The variable "land status" indicated the number of acres of state inholdings, private inholdings, and planned realty actions in the wilderness study area. This information can be considered an issue of wilderness manageability. That is, the higher the acreage of inholdings, the less manageable the area is as wilderness.

Oregon

Similar to New Mexico BLM, Oregon BLM included quantified information about minerals, energy, and range in each wilderness study area. In addition, the agency assessed recreational use, the presence of special features, land status, and some economic information for the wilderness study areas (USDI Bureau of Land Management 1989).

The agency used a two-part rating system to evaluate the presence of mineral and energy resources. It assessed the overall potential for the occurrence of the resource (e.g., potential that coal exists in wilderness study area *X* for coal) and the level of certainty about the assessment of potential (e.g., evidence that the coal potential is high, moderate, or low in wilderness study area *X*). Oregon BLM's assessment of range resources was similar to New Mexico's in that it recorded both range potential (e.g., total licensed AUMs in the wilderness study area) and range developments (e.g., number of troughs).

As an indication of recreation potential, Oregon BLM assessed the types of recreation uses that occur in each wilderness study area (e.g., hunting, backpacking). These measures provide information about both primitive and developed recreation use of the wilderness study areas. The Oregon wilderness

EIS does not include a quantification of outstanding opportunities for solitude. Unlike the New Mexico wilderness EIS, it does include information about special features of the wilderness study areas that would be protected with wilderness designation (e.g., geologic features, plant and animal species).

Similar to New Mexico BLM, Oregon BLM recorded land status, including the acres of private and state inholdings as well as split estate acreage.[7] As mentioned earlier, inholdings might be expected to cause management problems. Finally, Oregon BLM included information about the lower and upper limits of local personal income generated annually by the resource outputs of the wilderness study areas.

Utah

Similar to the other two state BLM offices, Utah BLM included quantified information about minerals, energy, and range in each wilderness study area. In addition, the agency assessed various wilderness characteristics and land status for the wilderness study areas (USDI Bureau of Land Management 1990).

Utah BLM assessed mineral and energy resources in the wilderness study areas using a two-part rating system similar to that of Oregon BLM. The ratings include an assessment of both the geologic favorability of the tract for the occurrence of the mineral and an estimate of the certainty that the mineral does or does not exist in the wilderness study area. With respect to range resources, the Utah wilderness EIS records both range potential and range developments.

Unlike the other state BLM offices, Utah BLM included a quantified assessment of each wilderness study area with regard to statutorily defined wilderness characteristics. It recorded an assessment of the number of acres in each wilderness study area that provide each of three wilderness characteristics (naturalness, outstanding opportunities for solitude, and outstanding opportunities for primitive recreation). In addition, the Utah wilderness EIS assesses various special features including scenic quality and historic, ecological, and geological features.

Like New Mexico and Oregon BLM, Utah BLM recorded information about land status in the form of acres of inholdings. As mentioned earlier, inholdings might be expected to cause management problems. The Utah wilderness EIS also includes information about the status of land adjacent to the wilderness study area where that land was an established natural or wilderness area. Similar to inholdings, adjacent land status affects wilderness management. If land adjacent to a wilderness study area is already an established natural or wilderness area, one might expect that it is managed in a way compatible with wilderness designation. This could make manageability of BLM land as wilderness easier.

[7] "Split estate" refers to land in which ownership of surface and mineral rights are held by different entities.

For the results presented in the tables, we treated missing values for the resource assessments as zero potential. We assumed that if the agency did not include the information about that resource for a given wilderness study area, that resource was not important to how the study area was designated. That is, the weight of the missing resource potential in the decisions was zero. However, as a check, we conducted regressions deleting cases with missing values on a pairwise basis and using mean substitution for missing values. The results for these regressions were very similar to those presented.

A methodological difficulty involved the number of variables relative to the number of cases. The wilderness EISs include more resource variables than wilderness study areas. In most cases, the number of variables is reduced appropriately through the multiple-use groupings. For most of the multiple-use specific regressions, the number of independent variables ranged from 2 to 10 compared with 44 cases in New Mexico, 77 cases in Oregon, and 82 cases in Utah. For energy and minerals, however, the number of variables approached the number of cases. For instance, in New Mexico the wilderness EIS included 43 different mineral measures. We reduced the number of mineral variables included in the regression analysis on the basis of Pearson r values. We assumed that mineral variables that had a Pearson r with recommended percentage wilderness below 0.1 had little influence on agency recommendations. The mineral variables included in the analyses are marked by an asterisk in Tables 1, 2, and 3. We tested our assumption by conducting a regression analysis on the eliminated variables and found that none were statistically related to agency recommendations. In addition, all mineral variables were incorporated into the average mineral variable to determine whether overall mineral potential is statistically related to agency recommendations.

Results

The results of the regression analyses appear in Tables 4 through 6. The tables provide the standardized regression coefficients (betas) for the statistically significant (at the $p < 0.05$ level) resource variables within each multiple-use category and for the aggregate analysis. In addition, the R square, adjusted R square, and F statistics are shown for each regression equation. More detailed technical information can be obtained from the authors.

Overall, the results indicate that although some of the resource potentials assessed by the BLM are statistically related to agency recommendations, the vast majority are not. In addition, in some cases, resource potential was related to wilderness recommendations in a counterintuitive direction. In New Mexico, only 4% (3 out of 79) of the resource potentials were statistically related to the recommendations in an intuitive direction. In Oregon, 12% (7 out of 57) of the potentials were statistically related in an intuitive direction. In Utah, 13% (7 out of 54) of the potentials were statistically related in an intuitive direction. The categories that show consistent dominance in their relationship with agency

TABLE 4 Multiple Linear Regression Analyses of Resource Potential with Wilderness Recommendations in New Mexico (Dependent variable = percentage wilderness recommended; $N = 44$)

Statistically Significant Resource Variables	Wilderness Resources Betas	Energy Resources Betas	Mineral Resources Betas	Range Resources Betas	Range Developments Betas	Land Status Betas	Aggregate Multiple Use Betas
Hours from Albuquerque, NM (1)	–0.42						
% WSA with Hi/Mod Energy Potential		0.62					
Humate Potential			0.33				
Manganese Potential			–0.34				
Sand and Gravel Potential			–0.28				
Number Mining Claims			0.25				
Number of Head of Livestock				0.42			
Number of Reservoirs Present					0.50		
Inholdings as % of WSA						0.31	
Sand and Gravel Potential							–0.40
Hours from Albuquerque, NM							–0.33
Manganese Potential							–0.31
R Square	0.18	0.38	0.45	0.17	0.25	0.10	0.42
Adjusted *R* Square	0.16	0.37	0.39	0.15	0.23	0.08	0.37
F Value	9.23**	26.18***	7.91***	8.80**	14.07***	4.60*	9.51***

*p <0.05; **p <0.01; ***pp < 0.001.
(1) Hours from Albuquerque, NM, is a measure of opportunities for primitive recreation and solitude.

TABLE 5 Multiple Linear Regression Analyses of Resource Potential with Wilderness Recommendations in Oregon (Dependent variable = percentage wilderness recommended; $N = 77$)

Statistically Significant Resource Variables	Recreation Resources Betas	Special Features Betas	Energy Resources Betas	Mineral Resources Betas	Range Resources Betas	Land Status Betas	Dollar Resources Betas	Aggregate Multiple Use Betas
Rockhounding Use	0.27							
Rafting Use	0.25							
Special Geological Features		0.28						
Geothermal Certainty			−0.29					
Diatomite Favorability				−0.38				
Silver Favorability				0.25				
None					—			
Acres Split Estate Land						−0.26		
Personal Income from WSA (lower limit)							−0.25	
Diatomite Favorability								−0.38
Personal Income from WSA								−0.21
Special Geological Features								0.22
Rockhounding Use								0.21
R Square	0.12	0.08	0.08	0.24	NA	0.07	0.06	0.33
Adjusted *R* Square	0.10	0.06	0.07	0.22	NA	0.06	0.05	0.29
F Value	5.19*	6.27*	6.68*	11.94***	NA	5.51*	4.98*	8.88***

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

TABLE 6 Multiple Linear Regression Analyses of Resource Potential with Wilderness Recommendations in Utah (Dependent variable = percentage wilderness recommended; $N = 82$)

Statistically Significant Resource Variables	Wilderness *Resources* *Betas*	Scenic *Designation* Betas	Energy Resources Betas	Mineral Resources Betas	Range Resources Betas	Land Status Betas	Aggregate Multiple Use Betas
Primitive Recreation Opport	0.62						
Ecological Features	–0.20						
% WSA Designated Class A		0.46					
Coal Favorability			–0.43				
Geothermal Favorability			–0.24				
Other Mineral Favorabilty				–0.39			
Aver Mineral Favorabilty				0.30			
# Proposed Range Develop					–0.23		
WSA Adjacent to Wild Area						0.30	
Primitive Recreation Opport							0.46
Coal Favorability							–0.29
Other Minerals Favorabilty							–0.23
R Square	0.37	0.21	0.17	0.20	0.05	0.09	0.44
Adjusted *R* Square	0.35	0.20	0.15	0.18	0.04	0.08	0.42
F Value	22.73***	21.58***	8.23***	9.64***	4.67*	7.97**	20.53***

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

recommendations are minerals and wilderness characteristics. This is not too surprising and coincides with our expectations. It is surprising that most of the range variables showed either no significant relationship or a positive relationship with the recommendations (i.e., as range potential or developments increased, the percentage of the wilderness study area recommended for wilderness increased).

The aggregate, multiple-use equations for each of the states explain between 29% and 42% of the variance in wilderness recommendations. Based on these results, we might conclude that the recommendations were coordinated to some degree. However, given that more than half the variance in the recommendations is not explained by the information in the EISs, we can also conclude that something other than the information about resource potential presented in the wilderness EISs affected wilderness decisions. The following paragraphs present the results on a state-by-state basis. A discussion of the implications of the results relative to NEPA follows in the next section.

New Mexico Results

The New Mexico results indicate that at least one resource value from most of the multiple-use categories exhibits a statistically significant relationship with the agency wilderness recommendations (see Table 4). However, 70 out of 79 resource measures (89%) are not statistically related to the agency recommendations. Furthermore, the direction of the statistically significant relationships are not always in the expected direction.

Of the individual multiple-use categories, the mineral and energy resource results are the most strongly related to the agency recommendations (adjusted R square = 0.39 and 0.37, respectively). Two out of the four statistically significant variables in the minerals equation occur in the expected direction. That is, as the manganese and sand/gravel potential increases in the wilderness study area, the percentage of wilderness recommended decreases (beta = –0.34 and –0.28, respectively). However, the other mineral resources—humate potential and number of mining claims—are related in the opposite direction; as humate potential and number of mining claims increase, the percentage of wilderness increases (beta = 0.33 and 0.25, respectively).[8] The energy results exhibit the same phenomenon. The one variable included in this equation—percentage of wilderness study area with high/moderate energy potential—is related positively to the percentage of wilderness recommended (beta = 0.62). So, although two of the mineral resources do show the expected effect of decreasing the chance that an area will be recommended for wilderness, 50 out of 55 mineral and energy measures (91%) are not statistically related to agency recommendations.

[8] We conducted the analysis omitting the variables with the counterintuitive direction (humate potential and mining claims). The results were very similar to the ones reported and showed a drop in the adjusted R square to 0.28.

The analyses of range resources and range developments also produced equations that account for some of the variance in agency recommendations (adjusted *R* square = 0.15 and 0.23, respectively). However, similar to the energy equation, the statistically significant independent variables in the equations show a counterintuitive direction. As the number of head of livestock and number of reservoirs present in a wilderness study area increase, the percentage of recommended wilderness acreage increases (beta = 0.42 and 0.50, respectively). Apparently, range resources were not a barrier to the agency making a recommendation in favor of wilderness.

The final category of independent variables that was statistically related to agency recommendations is wilderness resources (as measured by distance between wilderness study area and urban centers). The strength of the equation in predicting agency recommendations is the same as that produced in the analysis of range resources (adjusted *R* square = 0.16). The independent variable in this equation—hours from Albuquerque—is related in the expected direction: the shorter the distance between the wilderness study area and Albuquerque, the higher the percentage of wilderness recommended (beta = –0.42).

Finally, it should be noted that the analysis of land status variables indicates that the acreage of inholdings as a percentage of the wilderness study area is statistically related to wilderness EIS recommendations (adjusted *R* square = 0.08). However, this relationship is in a positive direction (beta = 0.31), seeming to suggest that as the percentage of inholdings increases, the percentage of the wilderness recommended also increases. This does not make intuitive sense, given that inholdings make management of wilderness areas more complex and potentially difficult. This result is similar to that of the analysis of range resources, and it appears that the presence of inholdings was not a barrier to wilderness designation.

The results of the aggregate analysis confirm the results of the individual equations.[9] The equation explains just over one third of the variance in agency recommendations (adjusted *R* square of 0.37), and the contributing variables are the mineral and wilderness resources. The relative strength of the resource potentials in the equation echoes the order of strength of the individual resource use categories, but to a different degree. Sand/gravel potential is a slightly stronger predictor of the agency recommendations (beta = –0.40) than is the distance between wilderness study areas and Albuquerque (beta = –0.33). Manganese potential is related to the same degree as the distance between wilderness study areas and Albuquerque (beta = –0.31). However, we are left asking what accounts for the remainder of the variance in agency recommendations and why most of the resource potentials show no significant relationship with agency decisions.

[9] In conducting the aggregate analysis, we incorporated the resource values that showed a relationship with the independent variable in the intuitive direction. These are the results presented here.

Oregon Results

The Oregon results are very similar to the New Mexico results (see Table 5). Although at least one resource value from most multiple-use categories is statistically related to agency wilderness recommendations, most of the information is not related. Out of 57 resource measures, 49 (86%) are not statistically related to the recommendations. Again, some of the resource potentials show a relationship in a counterintuitive direction.

Of the individual land use categories, the mineral resource equation shows the strongest relationship with agency recommendations (adjusted R square = 0.22). The direction of one out of the two statistically significant variables in the mineral equation occurs in the expected direction. That is, as the diatomite favorability increases in the wilderness study area, the percentage of wilderness recommended decreases (beta = –0.38). However, the second variable—silver favorability—is related in the opposite direction; as silver favorability increases, percentage wilderness increases (beta = 0.25).[10] The energy equation explains quite a bit less variance in agency recommendations (adjusted R square = 0.07). The one variable included in this equation, geothermal certainty, is related in the expected direction. As the certainty of geothermal resources increases, the percentage of wilderness recommended decreases (beta = –0.29). Thus the presence of some mineral and energy resources is statistically related to agency recommendations. However, 29 out of 32 (91%) recorded mineral and energy potentials are not statistically related to agency recommendations.

Interestingly, the analysis of range resources indicates that none of these measures is statistically related to agency wilderness recommendations. This suggests that the agency did not consider the range information included in the EIS in making recommendations.

Analysis of both categories associated with wilderness—special features and recreation resources—indicated that some of these resource potentials are statistically related to agency recommendations (adjusted R square = 0.06 and 0.10, respectively). In the case of special features, wilderness recommendations are positively affected by the presence of special geological features (beta = 0.28). This makes intuitive sense. In the case of recreation resources, the results are more difficult to understand. Both rockhounding use and rafting use show a positive relationship with the recommendations (beta = 0.27 and 0.25, respectively). It is unclear why these two uses would be significant whereas hiking and camping use are not (see Table 2 for a full listing of the variables in this category). Furthermore, rockhounding use does not appear to be especially compatible with wilderness designation as it is not particularly primitive. This relationship between rockhounding and wilderness recommendations may be

[10] We conducted the analysis omitting the variable with the counterintuitive direction (silver favorability). The resulting equation was very similar to the one reported and showed a small drop in the adjusted R square to 0.18.

coincidental. It is surprising that the presence of more primitive recreational uses in a wilderness study area does not appear to affect the wilderness EIS decisions. It is also surprising that the amount of variance explained by these categories is so low. Apparently information about special features and recreation, as reported in the wilderness EIS, did not influence recommendations very much.

The analysis of the dollar resources category produced results that account for some of the variance in agency recommendations (adjusted R square = 0.05). The significant value in this equation is the lower limit of personal income derived from the wilderness study area, which shows an intuitively expected relationship: as income derived from the wilderness study area increases, the percentage of wilderness recommended decreases (beta = –0.25).

The final category of independent variables that are statistically related to agency recommendations is land status. The strength of the equation in predicting agency recommendations is the same as that produced in the analysis of special features (adjusted R square = 0.06). The independent variable—acres of split estate land within the wilderness study area—shows a relationship in the expected direction: the greater the number of split estate acres, the lower the percentage of wilderness recommended (beta = –0.26). This is an issue of manageability of a wilderness study area as wilderness. The likelihood of management problems increases with more complicated ownership arrangements. Thus information about land status was reflected in agency decisions, albeit to a small degree.

The results of the aggregate analysis confirm the results of the individual equations.[11] The equation explains between one quarter and one third of the variance in agency recommendations (adjusted R square = 0.29), and the contributing variables are the mineral resources, dollar resources, special features, and recreation resources. The relative strength of the independent variables in the equation echoes the order of predictive strength of the individual resource use categories. The aggregate equation shows the one mineral variable to be the strongest predictor (beta = –0.38) and the other three to be almost identical with one another (beta = –0.21, 0.22, 0.21). This is very similar to the results from the individual categories. However, the results of the Oregon analysis indicate that the information in that state's wilderness EIS is less related to the agency decisions than is the case in the other two states. Furthermore, most of the resource potentials are not statistically related to agency recommendations, and most of the variance in agency recommendations remains unexplained.

Utah Results

In the results of the Utah analysis, at least one resource value from most of the multiple-use categories exhibits a statistically significant relationship with the

[11] In conducting the aggregate analysis, we incorporated the resource values that showed a relationship with the independent variable in the intuitive direction. These are the results presented here.

recommendations, and most of those relationships are in the expected direction (see Table 6). However, once again, most of the resource potentials are not, in general, statistically related to agency recommendations (45 out of 54, or 83%).

Of the individual multiple-use categories, the wilderness resources equation shows the strongest relationship with agency recommendations (adjusted R square = 0.35). This is not surprising, as one would expect wilderness characteristics to be associated with recommendations. One resource value included in the equation is percentage of the wilderness study area with outstanding opportunities for primitive recreation, and the direction of the relationship is positive, as expected (beta = 0.62). However, it is relevant to note that this and several other measures of wilderness potential used in Utah (percentage of wilderness study area with naturalness and opportunities for solitude) are subjective relative to other wilderness measures. For example, New Mexico used an objective measure of opportunities for primitive recreation and solitude in assessing the hours of driving time from major urban centers. Although this measure doesn't represent the quality of opportunities, it at least provides some objective sense of the quantity of opportunities available in a wilderness study area. Other objective measures of wilderness resources include the presence of threatened and endangered species and cultural resource sites. In fact, the second variable in the wilderness category that is statistically related to the agency recommendations is ecological features. However, it is related in a counterintuitive direction (beta = –0.20). Therefore, an interpretation of the relevance of Utah's wilderness measures relative to agency recommendations must take into account the subjective nature of assessing naturalness and opportunities for recreation and solitude, without reference to some observable phenomenon. It is possible that the percentage of wilderness study areas offering naturalness and outstanding opportunities for primitive recreation and solitude were assessed in light of wilderness decisions that were already made.

Related to wilderness characteristics, one measure of wilderness study areas was the scenic designation category. This also shows a statistically significant relationship to agency recommendations (adjusted R square = 0.20). In this category, the percentage of the area designated class A (the highest quality) is related in a positive direction, as expected (beta = 0.46). Scenic designations exist outside of the wilderness process and do not involve the same type of subjectivity as agency assessment of outstanding opportunities for solitude and primitive recreation. Apparently the presence of wilderness characteristics, as reported in the wilderness EIS, did have some influence on agency decisions.

The third strongest set of resource potentials was the mineral resources category (adjusted R square = 0.18). The directions of the two statistically significant resource potentials in this equation are mixed. One, other minerals favorability, occurs in the expected direction (beta = –0.39). The other, average mineral favorability, has an unexpected positive relationship (beta = 0.30).[12] Although the former measure (one in which the potential for several minerals is

grouped) might lead to the conclusion that overall potential for minerals (rather than individual minerals) led to lower wilderness recommendations, the latter contradicts this. The evidence about the influence of minerals is unclear. The energy equation explains a similar level of the variance in agency recommendations (adjusted R square = 0.15). The two resources included in this equation, coal favorability and geothermal favorability, are related in the expected direction. As the favorability of these resources increases, the percentage of wilderness recommended decreases (beta = –0.43 and –0.24, respectively). Thus the presence of some minerals and energy resources are a barrier to recommendations in favor of wilderness. However 24 of 28 (86%) minerals and energy potentials are not statistically related to agency recommendations.

In the range resource category, only one variable seemed to influence agency decisions: proposed range developments (adjusted R square = 0.04; beta = –0.23). This relationship is in the expected direction—that is, as the number of proposed developments increases, the percentage of wilderness recommended decreases. However, the equation that includes the range variable does not explain much of the variance in agency decisions (4%), and furthermore, the remainder of the range variables are not statistically related to recommendations. Apparently range resources included in the Utah wilderness EIS did not greatly influence wilderness recommendations.

The final category of independent variables that are statistically related to agency recommendations is land status (adjusted R square = 0.08). The independent variable, wilderness study area adjacent to other wild areas, shows a relationship in the expected direction: areas adjacent to wild areas are more likely to have higher percentages of wilderness recommended (beta = 0.30). This is an issue of manageability of a wilderness study area as wilderness. Management of an area as wilderness may be made easier by the presence of already existing, adjacent natural areas. Thus information about land status was reflected in agency decisions, albeit to a small degree.

The results of the aggregate analysis confirm the results of analyses of categories of resource use.[13] The equation explains between one third and one half of the variance in agency recommendations (adjusted R square = 0.42), and the contributing variables are the wilderness, energy, and mineral potentials. The relative strength of the independent variables in the equation echoes the order of predictive strength of the individual resource use categories, but to a different degree. Opportunities for primitive recreation play the largest role in the equation (beta = 0.46), with energy and minerals potentials having the second largest role (two variables appear in the equation with beta = –0.29 and

[12] A regression analysis was conducted omitting the variable with the counterintuitive directions. The resulting equation was similar and showed a drop in the adjusted R square to 0.10.

[13] In conducting the aggregate analysis, we incorporated the resource values that showed a relationship with the independent variable in the intuitive direction. These are the results presented here.

–0.23).[14] However, most of the information about resource potential within the wilderness study areas is not statistically related to agency recommendations. Furthermore, more than half the variance in the wilderness recommendations is not explained by the resource potentials that are statistically related to the recommendations.

Summary of Results

Overall, the results of the regression analyses for New Mexico, Oregon, and Utah indicate that a small amount of the data in the BLM wilderness EISs is related to agency recommendations. What does this say about the role of EISs in federal agency decision making? It may provide some limited support either for the proposition that the EISs are used for rational decision making or for the proposition that they are used for decision justification. However, this conclusion must be tempered by the fact that so few variables were related to agency wilderness recommendations. Most of the information provided in the EIS does not appear to be related at all to the recommendations. In addition, there is the question of the statistically significant resource potentials that were related to agency recommendations in an unexpected direction. It may be that these relationships are coincidental. Finally, the information that is statistically related accounts for only 29–42% of the variance in agency recommendations. We are left asking what accounts for the remainder of the variance and why so much of the data collected does not appear to be relevant. One possible factor is public input.

The Role of Public Input

What role, if any, did public comments play in the wilderness EIS process? If they do play a role, then there is support for the view of the EIS as a consensus-building tool. That is, the agency can take account of the agendas of other actors and adjust their decisions as appropriate. As mentioned earlier, one clue about the impact of public comments is whether or not the agency made changes from the draft to the final wilderness EIS. The public did comment on the wilderness EISs, and these comments expressed a wide range of opinions both in favor of and against wilderness recommendations. If changes occurred from the draft to the final, we cannot rule out the possibility that these comments affected agency decisions. If little or no change occurred, then it would appear that the comments had little to do with agency recommendations.

[14] If the analysis is conducted omitting the subjective variable, opportunities for primitive recreation, the variables that show a relationship are percentage of the wilderness study area designated scenic class A (beta = 0.39), coal favorability (beta = -0.20), and wilderness study area adjacent to wild area (beta = 0.21). This equation has an adjusted R square of 0.30—significantly lower than the equation that includes opportunities for primitive recreation. Thus the percentage variance explained by objective measures of resource potential explain less than one third of the variance in agency decision making.

In New Mexico, very few acreage modifications were made in the draft. A total of 5 out of 44 wilderness study areas experienced a change in acreage recommendation. Two of these were fairly minor and involved less than 150 acres. The gross change in acreage recommendations added up to 15,724 acres, or 1.6% of the total 953,250 acres studied. Overall, the agency altered their recommendations for wilderness designation from 59% of the wilderness study area acreage to 57%. Either the public did not suggest many changes for the agency to adopt or, if they did, the agency did not incorporate the suggestions.

In Oregon, the BLM made more significant changes between the draft and final wilderness EISs. The agency altered their recommendations for 24 out of 85 wilderness study areas. Changes were made in the recommendations for a total of 209,464 acres, or 8% of the total land under study. The final wilderness EIS recommended wilderness designation for 128,342 more acres than did the draft. This represents a change from 38% to 43% of the wilderness study area acres recommended for wilderness. Public comments may have had some role in these modifications, but without further research, it is impossible to say for certain.

In Utah, BLM recommendations also changed from the draft wilderness EIS to the final. Acreage recommendations changed for a total of 30 out of 84 wilderness study areas. The BLM modified their recommendation for a total of 292,577 acres, or 9% of the total wilderness study area acreage. However, the balance of wilderness/nonwilderness recommendations was not so dramatically altered. The final wilderness EIS recommended 82,817 more acres for wilderness than did the draft, a change from 58% of the total wilderness study area acreage recommended for wilderness to 61%. Did public comments have a significant impact on these decisions? Utah BLM received thousands of comments from the public (USDI Bureau of Land Management 1990, Volume 1). Although no counts of the signatures in favor and against wilderness designation are readily available, many individuals and groups wrote to the BLM to express their disagreement with the agency proposals.

That many interest groups disagreed with agency recommendations in Utah is supported by the fact that groups either in favor of or against wilderness developed their own Utah wilderness proposals. These ranged from the no-wilderness stance taken by the Utah State Legislature in the middle of the Wilderness Review (Utah State Legislature, 1986) to the Earth First! proposal that 15 million acres of Utah be designated wilderness. To say that the Utah BLM Wilderness Review has been controversial is to state the obvious. It is interesting to note that Utah BLM included some of these proposals, with maps, in their final wilderness EIS (USDI Bureau of Land Management, 1990, Volume 1). Certainly the agency was aware of public controversy in Utah and may have incorporated some of the concerns of both sides of the wilderness issue into their final recommendations.

Based on our comparison of the draft EISs to the final EISs, it is possible that the wilderness EIS served as a tool for gathering information about the agendas

of constituent groups in an effort to incorporate their preferences into the agency recommendations for Oregon and Utah. In those two states agency recommendations did change, although not substantially, from the draft to the final, and public input may have been part of the reason for these changes.

Conclusions

Taken together, the evidence from our analyses of the BLM wilderness EISs provides some limited support for each of the four propositions mentioned earlier about the use agencies make of the EIS. However, the fact that most of the information in the EISs is not statistically related to recommendations; that of the variables that are, some are related to recommendations in an unexpected direction; and that most of the variance in the agency's recommendations is unaccounted for by the remaining variables suggests that for the most part, the data in the EISs did not have an important influence on agency decisions. The lack of connection between data and recommendations gives weight to the proposition that the agency was primarily fulfilling a legal requirement through the EIS. Thus the BLM wilderness EISs may fall within the second phase of NEPA compliance articulated by Bear (1988): a predominant focus on compliance with the procedural requirements of NEPA, rather than its substantive intent.

Similar conclusions can be drawn from Mohai's (1987a, 1987b) studies of RARE II. Similar to analysis of the BLM wilderness EISs, analysis of the RARE II EIS did not reflect much of a link between information about resource potential and recommendations. As a result, it appears that the Forest Service also may have been primarily fulfilling a legally mandated procedure through the EIS, rather than achieving the spirit of the law.

That the principal application of the EIS by agencies appears to be legal procedure raises important questions about whether the resources, time, and effort expended in the EIS are being put to best use. The BLM produced many volumes of wilderness EISs over a span of a decade. The production of these documents consumed the time of resource professionals from many disciplines to identify the resource values affected by potential wilderness designation. Yet much of the information enumerated in the EIS appears not to have been used. Are there better uses of agency resources, and can the EIS process be made more useful? How might that be achieved? What are the realistic limitations of the EIS given political and organizational realities? Is it possible to move beyond Bear's (1988) stage two?

Among their proposals to improve the EIS, Bear (1988), Culhane et al. (1987), and Culhane (1990) suggested that the process would generate better decisions if the documents were made shorter and included less extraneous information. Similarly, Blumm (1990) indicated that participants in a roundtable discussion at the Symposium on NEPA at Twenty expressed "substantial sentiment . . . that lead agencies should write shorter, more concise, more analytic EISs in plain English" (p. 475). One might be led to conclude, based on analyses of the BLM

and USFS wilderness EISs, that such changes would be helpful. However, will the production of shorter, more analytic EISs ensure a link between the remaining information and agency decisions? Before assuming this can happen, one should consider more fully what roles the EIS should serve and what roles it can realistically be expected to serve. Can the common features of NEPA success stories be identified,[15] and if so, can they be used as the basis for suggesting changes to the process?

Although some have argued that the EIS should be a rational decision-making tool, it is embedded in a political context of various actors pursuing agendas that have little to do with environmentally sound decisions. It may be because of this political context that EISs are as long as they are. In addition, although shorter EISs may increase understanding of the documents, they cannot ensure that agencies will move beyond simply fulfilling legal requirements. Furthermore, even if agencies do move beyond simply fulfilling a legally mandated procedure, how are they likely to use the process and its associated information? Can it be assumed that the result will be "better" decisions based on information about environmental impacts? Possibly, but it is likely that political trade-offs and agency agendas will be an integral part of the process.

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[15] See, for example, Funk (1990) and O'Brien (1990).

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